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PHYSIOTHERAPY IN OPHTHALMOLOGY

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The Thermophore (Shahan)

This appliance permits graduated heat to be applied to the eye or adnexa. This locally alters the tissue metabolism with beneficial results in many disease conditions. It may also be used for cauterizing or subcauterizing in a particular manner. We consider this appliance to be one of our most valuable agents in the treatment of certain local inflammations of the eye.

Corneal Infiltrates: Such infiltrates are found in phlyctenular keratitis or keratoconjunctivitis, in tuberculous uveitis or tuberculous sclerotitis. Corneal infiltrates are often seen in the aged, who undoubtedly suffer from food deficiency conditions which are often manifested by eye complications early in the disease. It is noted more frequently in those suffering from the *debility* of age. Since they cannot get outside, particularly in winter, the vitamins and other necessary ingredients of their diet, though present in the food, are not assimilated or used in the body metabolism. One observes this same condition in many city dwellers who get no exercise in the sun and open air.

If you will permit me to digress for a moment, I would like to stress the importance of good food properly prepared so that its vital constituent may not be destroyed. Vegetables should be *fresh*, and so cooked that their salts are not thrown away in the water.

As a nation we are suffering from malnutrition, not because of insufficient food but because of a lack of intelligent interest in acquisition and preparation.

Frequently hotels and restaurants, where so many obtain their food, purchase old food —fruits and vegetables which have lost most of their vital constituents. What they have left are destroyed by the steam tables. Hence, when the vegetables reach the table they are scarcely more than cellulose. The food is also much too rich.

The fruits and melons are likewise deficient in the vital principles because they are picked green. The citrus fruits in particular may be mentioned as an example of this.

Our national habits of life further devitalize us. These habits extend from the time the child enters school until he completes his education. He is kept in school too long, and given too much work for his immature mind. He is not taught by the precept or example of his teachers the necessity for regular daily out-of-door exercise. A growing lad or girl should have ten hours' rest in bed. Few, indeed, get it! During adolescence, they begin to feel the need of stimulants and to use them.

The routine in college is still worse. The exercise prescribed is a minimum. Those physically fit are overtrained for purposes purely selfish on the part of the institution.

Not having been taught during their school and college days the value of sane and proper living, young business and professional men continue the same bad habits they followed in school. The results are frequently early degenerative changes, particularly of the cardiovascular system, the kidneys, liver, pancreas and other vital structures. They come to the ophthalmologist with headaches, asthenopia, early failing accommodation, and disturbances of the motor apparatus—particularly of convergence and divergence. They suffer from deficiency syn-

From the Department of Ophthalmology, The George Washington University School of Medicine, Washington, D. C. Read before the North Carolina Eye, Ear, Nose and Throat Society, Winston-Salem, September 26, 1940.

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dromes, and involvement of the cornea and sclerocornea may result. When the metabolism is disturbed by long continued faulty habits, it is difficult or impossible for us to obtain a cure. Structural changes of the tissues have occurred and these often are too far advanced to permit repair.

At the same time we undertake the local treatment of the various lesions of the eye, we must go over the history of the patient most fully and carefully, inquiring into his life *habits* as well as his medical and family history. We must consider an eye lesion as a local manifestation of constitutional disease—or, more probably, a metabolic disorder.

We have laid too great emphasis upon focal infection in such conditions. I do not wish to minimize the necessity of seeking such foci and eliminating them, but we must consider the *cause* of the infectious foci. There are undoubtedly a great many purely local infections. However, a high state of resistance induced by proper food, rest, exercise and controlled appetites minimizes focal infections, while converse conditions tend to invite them. To consider such matters in conjunction with local treatment distinguishes the medical doctor from the irregular practitioner in ophthalmology.

Corneal ulcers which result from the infiltrates before mentioned and ulcers resulting from other causes are amenable to treatment by the thermophore. The temperature and length of application vary rather considerably in the opinion of various surgeons. We use it on corneal infiltrates from 110 to 120 F. for thirty to sixty seconds, with the larger applicators. We seek to treat not only the actual area involved, but as much of the corneal area about it as may be reached by the applicator. This we feel is advantageous to the metabolism of the corneal tissues. For this reason too high temperatures or too long applications should not be used. Our purpose is to stimulate tissue and not devitalize or destroy it. For ulcers we use about the same temperature, or 160 F. for fifteen to thirty seconds. It is our habit to begin the treatment with lower temperatures and shorter applications until the individual reaction is ascertained. Considerable unnecessary suffering may thus be avoided, and we may form an opinion as to the temperature which may be used without injury to the tissues.

The same methods are used in scleritis, sclerokeratitis and tenonitis. We have found it particularly valuable in tenonitis, which yields with greater rapidity to this than to any treatment that we have tried. As a cauterizing agent in the palpebral form of vernal catarrh it has been used to advantage.

I would like to describe a disease entity which has been described only by Vogt, and then very briefly as an isolated case. This I have termed superficial punctate parenchymatous keratitis. It is characterized by redness of the eye which may closely simulate conjunctivitis and is usually mistaken for it. Symptoms of eye irritation are sometimes very marked. The patient may be awakened in the early hours of the morning by a feeling as if a very sharp and cutting foreign body were in the eye, associated with a flow of tears and a great discomfort. The eye is quite red. The attacks occur at irregular intervals and last over a long period. In the intervals between attacks the eye may be only slightly red, or perhaps not at all discolored.

The characteristic lesions are fine, white flecks in the cornea which can be seen only with the slit lamp using the high power. They are immediately beneath the epithelium and stain green with fluorescein. This condition is not uncommon. We have had 197 cases since 1922.

Several marked and chronic cases of blepharospasm, both tonic and clonic have been found to be due to this condition! These cases had been carefully studied by competent men in medicine, neurology and ophthalmology, and no cause had been found for the incapacitating blepharospasm. They were cured by the thermophore. We consider this the most brilliant performance of the thermophore in our hands.

The use of this instrument for the treatment of glaucoma has been advocated. We have had no experience with it in this disease. It is used with the tip placed over the ciliary body, the theory being that by lessening the activity of this structure the secretion of the aqueous is lessened and the pressure within the globe reduced.

High Frequency Currents Used in Medicine

1. Diathermy (high frequency): a million oscillations per second.
2. Radiothermy (very high frequency): ten to a hundred million alternations per second.
3. The Electric Knife.

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Publisher's bind

When *low frequency* currents are passed through the tissues of the living human body the electrolytic ions move to and fro with the alternations. There results polarization of the cells, nerve stimulation and muscular contraction.

With *high frequency* the ions have less time to move and heat is generated in the tissues. The absence of nerve stimulation and destructive electrolysis permits large currents to be passed through the body without harm and with consequent increase in heating effect. In the light of our present knowledge it may be said that the only effect of diathermy is the production of heat in the tissues. There are no specific effects so far as is known.

Damped and Undamped Currents: When a condenser or Leyden Jar is discharged through a spark gap the current surges back and forth like the oscillations of a pendulum. As the pendulum stops swinging after a push, so the electric oscillations die down—that is, they are "damped". The condenser may be repeatedly recharged and allowed to discharge, producing a series of damped trains of oscillations. This has been the method of generating the oscillating currents in radio, telegraphy, diathermy machines, etc.

The thermionic vacuum tube has provided a means for exciting continuous oscillations. The tube consequently has supplanted the spark gap radio transmitter and diathermy machine.

The damped current produces a much higher voltage, which favors the production of sparks and burns. The undamped current is smooth, steady and continuous, and has a minimum tendency to sparking.

The large electrodes produce heating of the deeper tissues with a minimum danger of burns. This heating, it should be remembered, has a selective action on the tissues, depending upon their resistance; for example, fatty tissue is heated less than vascular tissues.

This selective action is not too well understood; hence, selection of the current necessary to heat certain tissues is, so far as I am aware, scarcely practicable at this time.

The diathermy knife should not, in my opinion, be used about the eye. We have seen two eyes lost from corneal destruction with an anterior uveitis as a result of the use of the diathermy knife for removing chalazia. There was continuous exfoliation of the corneal epithelium, deep keratitis and anterior uveitis, all of low-grade and chronic progress, with final opacification of the cornea and shrinking of the globe.

We considered carefully the use of diathermy in ophthalmology, and decided to try it in those cases in which the vascular supply in the retina and choroid was inadequate—in sclerosis of the retinal vessels or of the choroidal vessels from any cause. We felt that it might be of particular use in elderly people with senescent sclerosis of the retina and choroid. These patients complain of inability to use their eyes with comfort. They can read only a short time before they suffer discomfort which may be mild or severe. Their vision dims after half an hour's reading. Since the elderly have little to occupy them, in many cases they read a great deal if they can. It is a tragedy to them and to their families when they can no longer read efficiently. We have tried diathermy upon these cases, but there remains a question in our mind as to how much good it has done. Quite a few appeared to be helped, though we could distinguish no change in the appearance of the vascular structures of the retina or choroid. Thus we were not sure whether the improvement was due to mental suggestion or to physical changes.

Great care is required in its use. We never felt quite safe with it for two reasons: First, because of the effect it might have upon the retina, particularly the macula; second, because of the danger of burns. With the greatest care we had one rather bad burn of the lid, which fortunately healed without scarring.

Theoretically, diathermy should be of value in the type of case above described. We believe it has value, yet we hesitate to recommend it on account of the possible dangers. "If you do no good, be sure you do no harm."

Detached Retina and the Use of Short Wave Therapy: We used at first the diathermy needles, and of late the Lacarrare apparatus, which is much simpler and, we think, more efficient. Our results have been about the average. We have taken on all cases which we felt had a chance of cure, and have not attempted to have a high percentage of cures by limiting our surgery to selected cases.

Our method is to study carefully the fundus with a widely dilated pupil, making a drawing of the detachment. Disinsertion,

tears or holes of the retina are searched for with extreme care and shown on the drawing in red and in proper position to the meridians and longitudes upon the sclera. The more accurately this is done the more successful will be our results. The fault or faults in the retina should be carefully isolated by a barrage of sclerochoroidal punctures. The detachment should be outlined by a like barrage. Such lines of barrage should be longitudinally crossed in several places by a like barrage.

Good drainage of the subretinal fluid should be secured. This, we feel, is of the greatest importance. It is best not to be too precipitate in operating upon a detached retina. We have had two cases in which spontaneous reattachment and healing have taken place. These cases have been under observation for twelve and eighteen years respectively. They were both peripheral detachments in middle aged, healthy people in active professional life.

It is our opinion that the technique of the operation is within reach of any qualified ophthalmic surgeon. Careful study of the literature is necessary in order to become familiar with the methods of localizing the disinsertion, the tears and holes in the retina, and of outlining the detachment with subsequent projection of these faults upon the exterior of the globe. This is not very difficult, but requires careful study.

Dr. Lawrence Post and others have used the Shahan thermophore in selected cases with success. The method appeals to us, but we have not had experience with it as yet.

Phototherapy

General: The use of a large mercury vapor or carbon arc is the best for this purpose. Its use is indicated in disordered metabolism due to deficient diet and lack of exposure to the sun. When this is impossible, the sun lamp is of value. In the aged and infirm it may be of great value. In both cases calcium and vitamin D in connection with exposure to the lamp may be advantageous.

One third of the body is exposed at a sitting, the dose being a slight skin erythema.

Tuberculous lesions of the eye obviously should be treated in conjunction with other measures already suggested. This refers to tuberculous uveitis, anterior or posterior. Phlyctenular conjunctivitis of probable tuberculous origin should be so treated. In our experience, however, many cases of phlyctenular keratitis and conjunctivitis are due to dietary deficiencies, particularly to the abuse of sugars and sweets of various kinds, especially by children.

Children are often not taught to eat properly. They frequently will not eat breakfast; at school they become hungry before the luncheon hour and buy the cheapest and most undesirable kind of candy and cakes. This destroys their appetite for lunch. The same thing happens in the mid-afternoon—more candy and then no appetite for dinner. After a month or more of this kind of thing the body metabolism is badly upset. Such a condition is not quickly amenable to correction. It may take months to accomplish it. Drugs will be of little help. Proper food, including milk, regular out-of-doors exercise, *sunshine,* and proper hygiene, will finally restore the child to health. We have found that the syrup of iodide of iron is helpful.

Local: A decade ago this treatment was considered of great value, and much was written upon it. We have always felt some doubt as to its efficacy, and have ceased using it. We always had a certain fear of the late effects upon the lens and possibly the retina, the macula in particular.

Thermal Therapy

Local heat: The use of this is so well known that it scarcely needs comment. It has great value in relieving pain in acute inflammatory conditions of the eye and adnexa, in iritis, acute glaucoma, uveitis, hordeola, acute chalazia, lachrymal gland or sac infections, etc.

Some individuals react badly to the use of local heat and are made worse. An acute neuralgia may be precipitated in certain individuals. In those with delicate skins an acute dermatitis may be set up which is difficult to control, and in the debilitated may be worse than the original condition. The dermatitis may cause a spastic entropion which may greatly aggravate the situation, and in the end might be of serious consequence.

Cold may act in a similar manner on the skin, and care in its use should be exercised, especially in the aged, particularly in regards to the cornea. The use of cold is not without danger. We have found it of use in vernal catarrh and allergic conjunctivitis. The latter is particularly amenable to cold. The use of holocain and adrenalin in conjunction with the cold will control the paroxysms of itching which are so distressing to the patient. The late Dr. de Schweinitz

many years ago directed our attention to holocain for such purposes on account of its curative as well as its anesthetic properties. Gifford[1] speaks of the use of cold following muscle operations upon the eye.

Infra-red rays: This gives a deeper heat and a dry heat, and has its place in our armamentarium. It is nothing more than heat, and no occult powers should be ascribed to it. It should not be used where the danger of hemorrhage is present, in conditions such as *acute* glaucoma and conjunctivitis.

Short wave diathermy: There is no question of the value of fever induced by means of Kettering's hypertherm. It is dangerous, and should be used only by those trained and experienced in its operation. An electrocardiogram and thorough physical examination should be required before the patient is subjected to the treatment. In an hour or less after the patient has been placed in the chamber the temperature may be increased to 40.5 C. It can be brought back to normal in from thirty to forty minutes. The chamber is a hot air cabinet in which the temperature and humidity can be controlled.

A temperature of 106 to 108 F. is sought, and the fever is continued for from five to eight hours. It is essential that the patient take salt and 5 to 8 liters of fluids during this period. Chronic and acute exudative uveitis and iritis, interstitial keratitis, syphilitic atrophy of the optic nerve and other low grade inflammations of the ocular apparatus respond best to its effects. Benedict says the method is of particular value in conditions accompanied by cellular infiltration such as uveitis, acute, subacute, or chronic, and particularly in scleritis and exudative choroiditis. It is particularly valuable in gonorrheal conjunctivitis.

McGavic[2] says that more experience and study is necessary before we may draw definite conclusions concerning its relative value, its indications and the number and frequency of the treatments desirable. He feels that corneal ulcer, phlyctenular conjunctivitis and metastatic meningococcic endophthalmitis are much benefited by this treatment.

Accessory treatment, particularly in syphilis, must be used. This is particularly true in syphilis of the nervous system, where the fever therapy is accessory to the treatment by the organic arsenicals and mercury.

1. Gifford, Sanford R.: Physical Therapy in Ophthalmologic Practice, Arch. Ophth. 19:171-180, February, 1938.
2. McGavic, John: Fever Therapy for Ocular Diseases, Arch. Ophth. 19:769-795, May, 1938.

Radium and Roentgen Therapy: In new growths in the lids or contiguous skin surfaces radiation is most valuable—also in the cornea, sclera or conjunctiva. Recurrent pterygia yield most satisfactorily to radiation. In our experience this condition can not be diagnosed until after it *has* recurred, although one may suspect it when the growth is very succulent and thick. The recurrence is usually very prompt, the growth reappearing within a few weeks. It is vascular, succulent and thick, and spreads with rapidity. Prompt treatment is desirable.

In vernal catarrh where there is marked involvement of the palpebral conjunctiva irradiation is satisfactory. When the growth involves the circumcorneal region it is likewise of value. In the cases with severe paroxysms of itching, small dosages often repeated are of value, according to Gifford[1].

This subject should not be dismissed without mentioning the possible dangers of these powerful and potentially destructive agents. The greatest danger lies in long deferred opacification of the crystalline lens. We have seen cataracts occur several years after exposure to x-ray or radium. Because of this danger we do not use irradiation about the eyes except in malignant or potentially malignant disease.

Massage

This is a valuable measure when skillfully done, and is helpful in many conditions. The eye symptoms in aged patients are often due, in part at least, to deficient circulation resulting from senescent arteriosclerosis. Skillful massage seems indicated and is helpful. No doubt the mental suggestion is also a factor. In certain cases of neuralgia it may be of help, but it is possible to aggravate the neuralgia.

We believe it to be of real value in chronic glaucoma and in the less severe attacks of congestive glaucoma, in conjunction, of course, with the usual treatment of this complicated disease.

Following filtering operations, particularly iris inclusion operations, it is essential to success. We feel that it is not employed as universally as it should be.

Orthoptic Training

This is one of the most valuable physiotherapeutical agents which we have employed in recent decades. We have said that "it does not cure squint, but squint cannot be cured without it." We are not yet aware of

the cause of squint, but in the vast majority of cases it is accompanied by deficiencies of fusion. Whether this be a cause or an effect need not be discussed here; what is obvious is that unless this defect be remedied there is deficient binocular vision or monocular vision only. Conditions today call for efficient vision more than ever before. The individual without efficient binocular vision is handicapped. Therefore we feel that orthoptic training is essential in the treatment of strabismus.

It should be begun as soon as the child is sufficiently mature to cooperate with the technician. The technician must be honest and intelligent, and must possess an understanding of childhood. The ophthalmic surgeon must be well informed upon the subject and the parents and child intelligent and cooperative. Have we not this combination, the probabilities of success are lessened.

In this connection we may discuss briefly accommodative convergent squint. This form of squint is due entirely to an excess accommodation causing an excessive convergence. In such cases there is no other factor—no abnormal position of rest or abnormal muscle —no factor x, as we term it. This factor x means a mechanical factor of some kind.

Obviously the diagnosis is necessary before treatment can begin. Though the statement calls for many modifications and qualifications, one may somewhat arbitrarily say that if the squint is entirely corrected by glasses, it is an accommodative squint. Many such accommodative convergent squints may be cured by orthoptic training. In two years we have had 33 cases of purely accommodative squint with 12 cures. In many of the cases the child may be cured of the squint without wearing glasses. We consider this method of treatment to be one of the outstanding accomplishments in ophthalmology in the last decade.

Purely accommodative squint is infrequent; most cases have both an accommodative factor and a mechanical factor, or a complicating vertical anomaly. It is necessary to correct these cases by surgery or other means. Purely accommodative squints should *not* be operated upon. To do so will produce a divergent squint for distance and a convergent squint for near objects.

Refraction

Even though this comes within the subject of physiotherapy there is insufficient time to discuss it here. It is very important in ophthalmology and is frequently not treated with the consideration it deserves.

Children should not be given glasses unless they require them. I would emphasize this statement. It appears to me that the general impression among many ophthalmologists is that all eyes having a refractive error should be corrected. In our opinon this is inadvisable. If the child's symptoms result from too long hours of study, insufficient exercise, or improper diet, we only add a further burden by putting glasses upon him that he does not really need. They may defeat the very objective we seek to attain. The expense is a factor very often, and we should not impose this upon the family when attention to the hygiene of life will correct the symptoms. We deplore the attitude of many in our profession that all refractive errors require glasses. Herein lies one of the main differences between the ophthalmologists and the irregular practitioners. We should seek to obviate the necessity of wearing glasses. We are professional men and are not primarily interested in selling goods.

THE NUTRITION SURVEY

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CHAPEL HILL

For a good many years the State Health Officer of North Carolina has stressed the basic necessity of nutrition improvement in any adequate program of public health administration. So many other public health problems have their foundations in the nutrition problem that it seemed illogical to concentrate on these rather than on the basic nutrition aspect. But the difficulty of approach to any solution of this problem—even to any adequate diagnosis of it—has discouraged the public health administrator from attacking it, in spite of the urgent need.

In the last five years, however, great advances have been made in the knowledge of the nutrition diseases, their cause and cure; and the hope has dawned that perhaps the time is now ripe to review this whole problem with the idea of doing something more definite about it. There are, for instance, the two facts about nicotinic acid that came

Read before the North Carolina Public Health Association, Pinehurst, May 13, 1940.

to light in the latter part of 1937: first, that nicotinic acid would cure black tongue in dogs[1], and, second, that it would cure pellagra in humans[2]. It is a blessing for the pellagrin that his dermatitis and his sore tongue and even his mental depression can be relieved within a few hours and cured in a few days by simply taking capsules of nicotinic acid; however, there are still borderline cases who go untreated, and patients suffering from several deficiencies at the same time whom nicotinic acid will not cure. A more basic attack on the food deficiency itself is necessary to solve the problem for them, and the cure is not a capsule but an adequate diet. Many pellagrins who formerly would have been considered typical cases have been shown to have some symptoms that are not improved by nicotinic acid. These are logically considered to have a separate disease curable by entirely different substances.

With the stimulus of these and other new discoveries about the vitamins, the public health administrator has begun to plan how he may apply the new knowledge to the problem of defective nutrition. Poverty and ignorance are constant companions; and defective nutrition seems to be an adjunct of both. To attack any one of these three is to attack all. Therefore the state health officer has begun to formulate a program for nutrition improvement which will embody a health program, a program against poverty and malnutrition, and an educational program that will drive home the knowledge that a varied diet containing all the essential food items is basic for optimum health.

In outlining such a program for nutrition improvement, it was natural to utilize experience gained in other control programs. The methods of attack on each of the great public health problems are similar. In tuberculosis the case finding program is the center of the plan, as it is in syphilis, malaria or hookworm control. The diagnostic method is the first concern of the one responsible for any control program. For a widespread disease such as malaria or hookworm, this takes the form of a survey, which attempts to examine every individual in a selected area or areas to determine the extent and intensity of infection. Only when this has been done is a program of control applied, and the results achieved are measured against the base line of this first survey.

A similar method seemed indicated in the nutrition program. It is first necessary to know the extent of the problem one is attacking. How many people are suffering from malnutrition? How severe is it? How many have actual deficiency disease and how many are borderline or subclinical cases? An answer to these questions is essential before a well grounded program of control can be put into operation.

A survey has been devised in North Carolina which seeks to answer some of these questions. The first concern was to choose the diagnostic methods to be followed in securing this information. As regards diagnosis in malnutrition, the technique is by no means as simple as it is in the other great public health problems. In malaria and hookworm a simple microscopic examination is relied on to diagnose the disease. In tuberculosis the case finding is a bit more complex. But there is, up to the present time, no simple or single method that can be relied on to certainly diagnose malnutrition. Many conditions other than lack of food essentials will cause conditions or symptoms which might be laid to deficiency in intake. In studying malnutrition it is necessary to regard the individual as a whole; and before a diagnosis is made all other possible causes must be ruled out. The nutrition survey therefore becomes very complex, and to be thorough and reliable the small intensive survey rather than a wide diffuse one is indicated.

Methods

There are several approaches. The original method so widely used in the nineteenth century, and still a valued background for any procedure, is the food intake survey, done by the questionnaire, or on smaller groups by the more accurate weighing procedure. The dietary of the American people was closely studied by Atwater[3], and norms were set up for total calories, carbohydrates, protein, fat, and mineral salts intake. This quantitative method is still valuable, in spite of its inaccuracies. But with the newer knowledge about vitamins the qualitative element has taken precedence and food surveys have become more detailed.

The medical history and physical examination have also been used from the start in

1. Elvehjem et al., in J. Am. Chem. Soc. 59:1767-1768, 1937.
2. Smith, Ruffin, and Smith: Pellagra Successfully Cured with Nicotinic Acid, J. A. M. A. 109:2054-2055, 1937.
3. Atwater: Annual Report, Conn. Agric. Exp. Sta. 4:106-161, 1891.

nutrition surveys. It is now accepted that a thorough physical examination is necessary before the complete picture is possible as to the nutritional status of any individual. The casual inspection for physique and pallor plus weighing and measuring is no longer considered an adequate investigation for this purpose. Since every morbid condition has an effect on nutrition, it is manifestly unscientific to attribute malnutrition to improper food until the presence or absence of such pathologic conditions has been investigated.

In addition to these two time-honored methods for assessment of nutritional status, there has been a continued attempt to put this procedure on a more objective basis. The following procedures have been introduced and each has its enthusiastic advocates.

Anthropometric measurements: Height, weight and width, chest depth, chest width, arm girth, thickness of subcutaneous fat, shoulder breadth, hip width, chest circumference, arm length and other measurements have all been said to be affected by diet and, therefore, have been suggested as criteria of nutritional status. Altogether nearly 30 such measurements have been suggested. The ideal would be for some one of them to answer the whole question as to the nutritional state of the individual being tested. That ideal has not been attained, nor has any combination of these tests proved adequate for that purpose.

Two interesting variants of these anthropometric measurements are what have been called slump and plantar contact. By slump is meant the ratio of standing height to height measured while lying on the back. There is a definite slump in height when the erect posture is assumed, and it has been claimed that the amount of this is an index of nutritional status. In the same way a comparison of plantar area in contact with the floor while sitting with the area in contact while standing has been used. Too many other factors will influence these two indexes for any complete reliance to be placed on small variations as indicative of inadequate nutrition.

Of more definite nutritional significance is the measurement of the skeletal status. The developmental age of a child can be definitely determined by comparing x-rays of the ankle, hip, wrist or other joints with normals for the various ages. The late Wingate Todd[4] gave precision to this method of work. But of equal importance for determination of nutritional status is the measurement of the degree of mineralization of the bones. Involved in this physiological process are at least three food essentials—calcium, phosphorus and vitamin D. And so in a nutrition survey an x-ray of one or more joints is made on each individual, using a lead grill record on each film. This latter makes possible the comparison of all these pictures with the normal and with each other as to the density of bone. By the use of a photoelectric densitometer this measurement can be placed on an entirely objective basis. That demineralization occurs in certain diseases and certain types of malnutrition is well recognized. In the nutrition survey it is hoped that the method will be of value in determining deficiencies in the food elements responsible for bone density.

In addition to the x-ray picture three other laboratory procedures are of value in this determination of skeletal status. These are the blood tests for calcium, phosphorus and phosphatase. The phosphatase test in particular has been found of great value in determining early rickets; and the blood phosphatase in acute rickets is many times the normal level. If this test proves to be of similar value in determining lesser degrees of food deficiency leading to conditions short of actual rickets, it will be very useful in nutrition surveys.

The condition of the teeth has also been used as an index of the nutritional status of an individual, but recent observation has shown that it is not possible to state certainly that caries and cavities are invariable indications of deficient intake of mineral salts and vitamins. That there is a direct relation between teeth and diet seems evident, but so many other conditions enter in that extreme caution is necessary in drawing conclusions. A careful examination of the teeth and gums is part of every physical examination.

Basal metabolism determination as a diagnostic method in nutrition surveys is chiefly useful for excluding individuals of obviously abnormal metabolism. Of much more value is the test for determining the protein content of the blood plasma. Nutritional edema has been established as a disease resulting from inadequate protein intake. In this dis-

4. Todd, Wingate: Nutrition: The Newer Diagnostic Methods, pp. 9-31. Annual Conference, The Milbank Memorial Fund, 1938.

ease the total proteins of the blood are lowered and the albumin-globulin ratio falls. If such findings, though in lesser degree, characterize the protein pre-deficiency state it will be a valuable indicator of nutritional deficiency in the pre-clinical stage. This relation is not yet established, but inclusion of the test in nutrition surveys seems clearly indicated at the present time.

Knowledge of the hemoglobin level is, of course, basic to any study of nutrition. Nutritional anemia is probably the most widespread of all deficiency conditions, its degree varying with the iron deficiency of the food intake. When other causes of anemia are ruled out, the hemoglobin level is a valuable indicator of the nutritional status of an individual. Three measurements—namely, the red cell count, the hematocrit and the hemoglobin determination—make possible the calculation of all the indexes on which diagnosis of the type of anemia is made.

Of more recent development are the tests that determine the level of vitamins in the blood plasma. The urinary tests are considered unsuited to survey procedures. Such blood tests are best done now with regard to vitamin C, and tentative levels for vitamin C in the normal individual have been proposed. The quantity of vitamin C found in the blood of a normal individual is about one part per 100,000. The exact significance of levels lower than those proposed as normal has not yet been established. Some individuals with no detectable vitamin C in the blood show no symptoms attributable to this lack. It is fair to assume that a certain level is necessary for the best of health.

A test for vitamin A is much less satisfactory. The body stores vitamin A in the liver, and when there is a deficiency in the intake of vitamin A, this store is given up most parsimoniously and over a long period. Therefore it takes a considerable period of time for deficiency in vitamin A intake to show up in patent symptoms. A method is at hand for extracting vitamin A in blood plasma and determining its quantity by the colorimeter. The significance of a low level found on a single examination in any one individual is yet to be determined.

Another test proposed for vitamin A predeficiency has been the test for visual acuity by the several photometric methods, the most recent and accurate of which is the adaptometer method of Hecht[5]. It was shown by the studies of Wald[6] that visual purple is partly composed of vitamin A, and that when it is bleached by light its regeneration depends on an adequate supply of vitamin A. The adaptometer of Hecht makes use of this principle, and by an ingenious device for changing the intensity of lights, it determines the interval of time necessary for the individual to regain normal vision after the bleaching with intense light. The use of this machine to determine deficiency in vitamin A intake was begun with enthusiasm, but at the present time its failure to show low thresholds of light vision in individuals obviously deficient in vitamin A intake has thrown doubt on its value.

Blood tests for vitamin B_1, or thiamin, the anti-beriberi vitamin, are being carried out in certain studies[7, 8], but so far are too complicated and indefinite to be of practical value.

Of utmost importance in surveys in this region is a test for nicotinic acid in the blood. Unfortunately, a test specific for nicotinic acid is not yet available.

The value of riboflavin, another component of the B_2 complex, in human nutrition has been established, and apparently its deficiency syndrome has been considered part of the pellagra symptomatology, until separated recently by Sebrell[9]. At least two methods of testing for this substance are available: one a bacterial growth test method using an acidophilic bacterium; and the other an acid titration method. Both of these methods are being studied for possible inclusion in nutrition surveys.

The North Carolina Survey

In setting up a nutrition survey in North Carolina the foregoing information was studied critically with the idea of including in the survey all methods that seemed valuable and practical. It was apparent from the start that the type of laboratory work necessary was so specialized that it was beyond the scope of work usually undertaken in public health laboratories. A natural suggestion was that the proper place for this biochemical work was a university medical school, where trained biochemists and physicians would be available to work on its problems. The State Board of Health and

5. Hecht, S.: The Relation Between Vitamin A and Dark Adaptation, J. A. M. A. 112:1910-1916, 1939.
6. Wald, G.: Carotenoids and the Visual Cycle, J. Gen. Physiol. 19:351, 1936.
7. Dixon: Manometric Methods, Cambridge, England, 1934.
8. Hennessy and Cerecedo, in J. Am. Chem. Soc. 61:179, 1939.
9. Sebrell and Butler: Riboflavin Deficiency in Man, U. S. P. H. S. Reports, 53:2282-2284, 1938.

Duke University Medical School, with assistance from the Rockefeller Foundation, are cooperating in this nutrition study. The laboratory work is all done at the hospital laboratory. A small committee of four was set up to outline procedures and to review critically the methods used, with the idea of changing them when changes seemed indicated by newer knowledge in this rapidly developing science. After due consideration this committee picked the following items as the basis for the first nutrition survey:

1. Food intake survey for a 7-day period for each individual.
2. Medical history and physical examination.
3. Laboratory examinations as follows: red cell count and volume, and determinations of hemoglobin, total proteins, albumin, phosphorus, phosphatase, vitamin A and vitamin C. All the tests are done on blood.
4. X-ray of the wrist and ankle.
5. Adaptometer test for visual acuity.

It was evident that a great amount of work would be involved in the examination of every individual and that a survey of an extensive group would be out of the question. It was, therefore, decided that the best procedure would be to choose a small, rural community with or without some industrial element, and to survey such a community as completely as the cooperation of the inhabitants would permit. In the light of information obtained from this first survey, methods could be improved and modified before a second area of a somewhat different type was undertaken. It seemed probable that by taking single communities conclusions could be drawn as to the nutritional status of such communities over large areas, and that procedures to ameliorate conditions found could be based on results obtained. With this end in view a nutrition study was organized January 1, 1940, with the three cooperating agencies, and a survey was begun in a small, rural community.

To give point to the whole procedure and to plan for carrying out any program that might arise from the nutrition study, a committee was organized which is to have general supervision of the nutrition study, to outline the main objectives and to elaborate a plan for applying the results of the present study, and to enlist the support of those agencies which must be relied on to carry it out. This committee has already had its first meeting with one or more representatives from the State Departments of Health, Education, Agriculture, Welfare; Duke University; the University of North Carolina; the Woman's College of the University of North Carolina; and the North Carolina State Medical Society. Active cooperation has been assured from each of these groups.

In the first community selected for survey a mass of interesting data is being collected. It is hoped that this can be presented to this group at a later meeting.

Summary

The background of the nutrition problem is discussed and the reasons for the North Carolina nutrition study and the methods of setting it up are given. Possible survey methods are discussed and the ones chosen for the North Carolina study are listed.

Abstract of Discussion

Dr. Carl V. Reynolds (Raleigh): Dr. Milam has given us a dissertation on one of the most important programs in the field of preventive medicine.

That nutritional study, coupled with the school health program reaching 900,000 school children of our state, will undoubtedly be one of the greatest influences on the restoration of health and the prevention of disease.

We thought we were doing well when we were able to divide our foods into proteins, carbohydrates, fats, and minerals. We thought we were stepping high, wide and handsome when we then could calculate those foods into caloric values and measure by guess the amount that one should have.

That was pioneer work. As Dr. Milam pointed out, then we were looking at quantitative foods. Now we are looking at qualitative foods. We are searching now, not for the clinical case of malnutrition, but for the subclinical case. We are trying to establish a known quantity in the field before disease attacks us.

This study, made possible through the Rockefeller Foundation, and so well directed by Dr. Milam, is a step forward. I think he makes twelve tests on every case, with the help of the chemists, the biochemists, the physiologists at Duke University. They make a thorough, painstaking examination, including x-ray of the bones of the wrist and of the ankle, to detect early symptoms of disease before any clinical symptoms are manifested.

We have with us two gentlemen whom I would like to present. One of them was with us in our pioneer work in public health fields of North Carolina, and to that gentleman North Carolina owes a deep debt of gratitude. His pioneer efforts have made it possible for this gathering to be here today. That gentleman is Dr. W. S. Rankin.

The second gentleman is one whom you know as well as you do Dr. Rankin. He is internationally known. He is a North Carolinian, too. We are proud of him. He has done a great service for North Carolina and for the world by his usefulness in the Rockefeller Foundation. It is through his efforts that we have been able to put on this nutritional program. I want to give those of you who do not know him a personal introduction to Dr. John Farrell.

Chairman Richardson: We shall, of course, be extremely happy to have both Dr. Rankin and Dr. Farrell participate in this discussion.

Dr. Farrell: I am glad to be here. I am of North Carolina, and I come back on every occasion.

When the Rockefeller Foundation becomes interested in a problem which is new and complex and extremely difficult, its solution calls for the best of scientific talent and the best leadership in the field of public health, both at the state and the county level. Conditions favorable for the advancement of knowledge and for the development of successful demonstrations in a field of this character, which cannot be undertaken in every locality are here; and as knowledge becomes available the agencies with which to disseminate and apply that knowledge likewise are in this state, and they are cooperating to a degree that is extremely rare in other states of this Union.

The significance of this nutrition problem cannot be over-estimated. We know that an important feature in the treatment of tuberculosis—although there are new developments—has been a generous, well-balanced ration along with rest and housing. We know of its effectiveness in combatting a disease very prevalent throughout the state and throughout the South—pellagra; of the responsibility of these nutritional deficiencies for scurvy and rickets.

If a well-balanced ration is of curative value in dealing with these diseases, isn't it all the more valuable as a medium for the prevention of these diseases at the time when they are in the subclinical zone? It is to make possible the recognition of these deficiencies, before there is any serious impairment of health, that Dr. Milam and his colleagues, the faculty of Duke University, are working. I wish to pay tribute to them and to express thanks, because they have been doing for years some of the best original research work in the field of nutrition, and when Dr. Reynolds gave them the opportunity to share in this, with one accord, in the clinic, the pediatric, the biochemical and the physiological departments, everyone cooperated enthusiastically, without receiving a cent of compensation.

Dr. W. S. Rankin (Charlotte): I am deeply grateful for the very kind commendation of a health officer so advanced in his ideas, and at the same time so sound. I don't know when I have been so encouraged as I was on two recent visits to the State Department of Health, when Dr. Reynolds was kind enough to take me through the departments and to explain what was going on and what was contemplated.

I look forward, as do Dr. Reynolds and Dr. Farrell, and these men associated with Dr. Milam, to some real constructive and far-reaching work through this comprehensive program—this new approach to the problem of nutrition, which is so closely related to so very many public health problems.

Heredity. — Knowledge of the mechanisms of heredity has been developed entirely within the last forty years. Progress was slow at first but has become increasingly rapid until now we feel justified in predicting the conscious control of the evolution of plants, animals and even of man himself. Thus in addition to having more and better tools, man, five thousand years hence, may be a better creature physically, mentally and morally.—**Blakeslee, Albert F.: Science Five Thousand Years Hence, Science, 92:388 (November 1) 1940.**

THE MANAGEMENT OF DIABETIC COMA WITH LIMITED LABORATORY AID

O. Norris Smith, M. D.

Greensboro

The present generation has seen the transformation of diabetes from a hopeless malady to a condition permitting a virtually normal existence. The public has not yet been taught that diabetes is compatible with normal life expectancy, with robust health, and with practically unrestricted activity; that of all chronic diseases, it is uniquely painless, clean, susceptible to treatment, and neither disfiguring nor contagious. Two prominent citizens of Greensboro have recently committed suicide soon after they learned that they had diabetes. Let this be a warning to each of us to approach the new diabetic with optimism.

Education of the diabetic patient in the understanding and management of his disease is the keystone of future normal health. Thorough study of diet will afford him considerable latitude in choosing proffered food. Bodily hygiene is important—especially the care of the feet beyond the age of 35. The diabetic must be particularly alert to avoid exposure to infections, and quick to treat even the simplest cold. He must understand that early degenerative changes are the price of laxness in his routine, and that ketosis and coma bring permanent additional damage to his pancreas. Whether he will exceed his normal life expectancy will depend chiefly upon his own understanding of and cooperation in the management of the disease.

About one in every fifty Americans will develop diabetes[1]. It is equally frequent in both sexes until middle age, and thereafter appears more commonly in women, reaching a ratio of 2:1 at the age of 70[2]. Both in intelligence and economic resources, diabetics are distinctly above the average. The physician who is able to handle this disease will accumulate a group of particularly intelligent and desirable patients, and will derive peculiar satisfaction in combatting so dangerous an antagonist.

Read before the Section on the Practice of Medicine, Medical Society of the State of North Carolina, Pinehurst, May 14, 1940.

1. Joslin, E. P., Dublin, L. I., and Marks, H. H., in Am J. M. Sc. 187:433, 1934.

2. *Duncan, G. G.: Diabetes Mellitus and Obesity, Philadelphia, Lea & Febiger, 1935.*

Every diabetic is a potential victim of coma, usually through infection or carelessness. The premonitory signs are variable and usually insidious, appearing over a period of days. Especially significant are loss of appetite, malaise, nausea, vomiting, abdominal pain, restlessness, drowsiness and exhaustion. The full-blown picture will soon follow: "air-hunger" dyspnea, dehydration, tachycardia, soft eyeballs, fruity acetone breath and unconsciousness. It is important clinically that the unconscious patient with profuse sweating is *not* in diabetic coma.

The management of diabetic coma in teaching hospitals is routinely guided by elaborate and frequent biochemical tests, to afford the students a better understanding of the metabolic changes and the therapeutic regimen from hour to hour. Such patients are usually handled by a team of at least three physicians—a senior and junior intern in charge of treatment, and the laboratory intern to report frequent blood studies. It is unfortunate that such a system of training does not teach the physician that a simple test often can replace a complex analysis; that for example, in jaundice, the demonstration of bilirubin in the urine is indicative of a direct Van den Bergh reaction or that, in diabetic coma, glycosuria means a blood sugar exceeding 170 mg. per 100 cc., and indicates the need for further insulin therapy without additional glucose.

In the majority of our hospitals, we do not have the assistance of interns, nor can the patient afford the expense of frequent blood analyses, even if the technician is available. In short, such laboratory teamwork is impossible. It is my purpose to show that such tests are superfluous, and that one diabetes-minded physician with intelligent nursing assistance can practically equal the success of teaching institutions in handling this emergency. With experience, the physician will derive almost as much information from frequent urinalyses as from frequent blood sugar determinations. By neither method will he be able to predict with any accuracy the insulin requirements beyond the immediate dose.

Glycosuria normally appears when the blood sugar exceeds 170 mg. per 100 cc., and its disappearance means that the blood sugar has fallen below that level. Although there is a hazard of cystitis, a continuously draining indwelling catheter will furnish urine which reflects the blood sugar level with a lag of only a few minutes—at least no greater than the time needed to determine the blood sugar level chemically. The method is of course dependent upon satisfactory renal output. One occasionally encounters anuria, but a recent paper[3] reports good response of this complication to the intravenous administration of 500 cc. of hypertonic (5 per cent) saline solution, followed by double the usual fluid administration. The Sheftel Urine Test Kit marketed by the Eli Lilly Co. affords a simple, convenient and accurate means of measuring glycosuria up to 6 per cent. (The recently marketed Galatest powder reaches its maximal color change with 1 per cent glycosuria, and this does not afford adequate leeway in the recognition of rapidly falling glycosuria during the early treatment of coma.) With such a set-up to measure frequently the glycosuria, one may safely continue heavy insulin therapy until the glycosuria approaches the vanishing point before administering any additional glucose whatever.

By the time glycosuria is controlled, consciousness is returning or has returned, and the degree of acetonuria becomes the indicator for somewhat less intensive treatment with insulin, oral glucose and saline. During this period, though the patient may be able to void frequently, it must be remembered that such a specimen constitutes a mixed accumulation, and does not reflect the blood sugar level at the time of micturition. The indwelling catheter is preferably retained until acetonuria is pretty well controlled.

The lone physician who is called to treat a comatose patient, and finds heavy glycosuria and acetonuria in the urine should not abandon the patient to seek further laboratory confirmation by blood analyses. It is well to take a blood sample for subsequent study, but the first duty of the physician is to institute promptly and to maintain adequate treatment, and not to be distracted by laboratory tests of academic interest.

There are few emergencies in medicine to compare with diabetic coma; treatment must be prompt and heroic in order to avert disaster. Our most important weapons are insulin, saline and warmth, while stimulants, gastric lavage and a cleansing enema are valuable subsidiary measures. Alkalies and much glucose are rarely necessary, and are

3. Root, H. F., and Riseman, J. E. F., in J. A. M. A. 110: 1780, 1938.

TREATMENT OF DIABETIC COMA WITH LIMITED LABORATORY AID

REMARKS:	CLINICAL STATE	INSULIN	FLUIDS	DIET	LABORATORY
Diagnostic Confirmation by Stat Catheterization Warmth Look for Pus Stimulants P.R.N. Gavage ($NAHCO_3$) Enema (Soap)	COMA Dehydration Tachycardia Air-Hunger Dry Skin Acetone Odor Soft Eyeballs	Average 210 U. Unmodified For C-V. Collapse Give 20 U. Intraven. Routinely Give (H) 50 U. Q. 30 Min. if Glycosuria is 4 plus. As Glycosuria Falls Continue Q. 30 Min. Smaller Doses Until Conscious.	Average 3-5 L. Saline 1 L. Saline I.V. Stat 3-5 L. Continuous Hypodermoclysis For Anuria 500 cc. 5% NACL I.V. and Double Fluids.	No glucose until Glycosuria Falls and then sparingly. (1 Gm./10 U. in Coma) Glucose by Vein and Stomach-Tube 25-50 Grams	Blood Sugar and CO_2 Q. 30 Min. helpful but not essential. Indwelling Catheter Glycosuria Tests Q. 30 Min. if 4 plus Q. 15 Min. if Fading
New Patient With Ketosis Start Here	KETOSIS Malaise Anorexia Abdominal Pain Nausea Vomiting Restlessness Drowsiness Fatigue	Q. 2 Hrs. Glycosuria 20 U. if 3 plus 10 U. if 2 plus 0 if 0 or 1 plus until urine is free of acetone.	Q. 2 Hrs. 200 cc. Hot Salty 3% Bouillon, Broth, Tea, Coffee. If Vomiting Give Parenteral Saline	Glucose 10 Gm. Q. 2 Hrs. Until Acetone-Free, With Insulin.	Test for Acetone and Sugar Q. 2 Hrs. to guide insulin dose. When Acetone-Free, Irrigate Bladder and Remove Catheter.
Pre- and Post-operative Routine	COMPLICATIONS Severe Infection, Injury, High Fever.	With each feeding enough to control glycosuria.	Force Fluids	Six Equal Feedings Q. 4 Hrs. Both Day and Night.	Test for Acetone and Sugar During Each 4 Hr. Period.
NEW PATIENT Uncomplicated 1. Basal diet and fractional urines for 3 days. 2. Determine fasting blood sugar. 3. Insulin P.R.N. and diet increase for activity and growth. STRESS Regular Exercise Study of Diabetes Weight Control OPTIMISM	CONTROL Be Lenient with the Elderly Diabetic With Protamine, Minor Postprandial Glycosuria is not thought harmful.	Prot. Zinc Insulin enough to eliminate nocturnal glycosuria and attain a normal fasting blood sugar level. If desirable to control postprandial glycosuria use old unmodified insulin. Diminish dosage with control, physical activity, weight loss.	Free Fluids	Basal Caloric Needs of expected wt. for age, sex, and height. (Moderate Cho.) Add allowance for activity and growth (High Cho. P.R.N.)	Fractional Urine Collection During Adjustments. 7 A.M. to 11 A.M. 11 A.M. to 4 P.M. 4 P.M. to 9 P.M. 9 P.M. to 7 A.M. Later routinely check overnight urine twice weekly. Written diary of Insulin, Weight, Urinalyses and Complications.

dangerous if they divert the physician's attention from the essential administration of insulin. Remember that minutes are important: if insulin is handy, 50 units should be given immediately, before transfer to the hospital. The patient's room should be equipped with insulin, parenteral fluids, catheterization tray, blankets and hot water bottles before his arrival.

To gain a more rational perspective and a more indelible understanding of the problem, let us arbitrarily divide the treatment of coma into three parts, roughly demarcated by clinical and laboratory evidence. The first stage ("coma" on the chart) is characterized by uncontrolled glycosuria and drowsiness, if not unconsciousness; it requires heavy doses of unmodified insulin every thirty minutes and continuous parenteral saline, and demands the constant attendance of a physician. It usually lasts two to five hours.

The average case of coma requires between 200 and 252 units of unmodified insulin during the first 24 hours, if no glucose is used[4]. Too little insulin means certain death; too much can be safely recognized through the disappearance of glycosuria with frequent urinalyses and is easily corrected with a little glucose. Until glycosuria approaches the vanishing point, it is unwise to give *any* glucose. The Mayo Clinic regards the depth of unconsciousness as a better guide to insulin dosage than the blood sugar level. Protamine zinc insulin has not yet been shown to deserve a part in the treatment of coma.

The initial dose of 50 units of insulin hypodermically should be supplemented in the presence of circulatory collapse with 20 units intravenously. Every thirty minutes a dose of 30 to 50 units hypodermically should be repeated as long as unconsciousness persists, administering small amounts of glucose by vein or stomach tube if necessary to maintain mild glycosuria. Remember that *in coma the efficiency of insulin is tremendously impaired*—that 10 to 20 units are necessary to metabolize each gram of excess glucose.

Dehydration is extreme, and the average patient should receive 5 liters of saline solution within the first 24 hours. An initial intravenous administration of 1000 cc. of normal saline solution should be followed immediately by a continuous saline hypodermoclysis of 2000-4000 cc. In acidosis, the chloride ion is excreted in combination with ammonia derived by splitting urea, and thus saline restores the alkaline reserve.

Coma patients should be wrapped in blankets and warmed with hot water bottles until the temperature rises to normal, when such measures may be discontinued.

Despite the presence, but especially in the absence of a history of dietary indiscretion or insulin omission, make a thorough search for pyogenic infection. An overweight elderly foreigner was hospitalized in impending diabetic coma with a history of a sprained ankle ten days previously. Despite intensive therapy, he lapsed into coma and died within a few hours. Autopsy disclosed a suppurative arthritis of that ankle. A higher index of suspicion for pus in this resistant case, and a simple diagnostic aspiration of the swollen joint, followed by surgical drainage would probably have saved this man. *Look for pus and drain it!*

When circulatory collapse is evident, one should frequently administer such stimulants as caffeine, adrenalin, or ephedrine.

Gastric lavage is particularly indicated in the presence of abdominal pain, distention or frequent vomiting. After lavage, 200 cc. of 3 per cent sodium bicarbonate left in the stomach will facilitate the subsequent administration of oral fluids.

A cleansing soapsuds enema is a wise routine measure, practiced in many diabetic clinics.

Glucose is certainly unnecessary until the glycosuria begins to clear up, and in the average case this means after 150 units of insulin have been given. As the blood sugar falls to a reasonable level, consciousness usually begins to return. The average coma blood sugar level is about 500 mg. per 100 cc. This represents only about one tablespoonful of excess sugar in the blood, and yet approximately 200 units of insulin are necessary to metabolize this small amount of glucose.

Hartmann's sodium lactate solution does correct the depleted alkaline reserve more rapidly than does saline, but unless the acidosis is unusually marked, as evidenced by a plasma CO_2 combining power of less than 10 volumes per cent, the administration of Hartmann's solution is often harmful, because it gives the physician a false sense of security and diverts his attention from the unaltered necessity of insulin in large doses.

With the control of glycosuria and the

4. Joslin, E. P.: Treatment of Diabetes, ed. 6, Philadelphia: Lea & Febiger, 1937.

return of consciousness, the second stage ("Ketosis" on the chart) begins, characterized by acetonuria. Treatment may be somewhat relaxed, insulin and glucose being given every two hours, and salty fluids on the intervening hours. With intelligent nursing assistance and good telephone communication, the physician should be able to direct subsequent therapy by remote control. This stage will probably last for twelve to thirty-six hours.

Every two hours a specimen of urine is taken directly from the indwelling catheter and tested for sugar and acetone; 100 cc. of orange juice or gingerale (10 Gm. of glucose) is given orally, and insulin is administered according to the glycosuria—20 units if heavy, 10 units if moderate, and none if slight or absent. These doses are rough suggestions, and will require revision for each patient.

On alternate hours the patient drinks 200 cc. of hot salty (3 per cent) broth or bouillon (Swift and Armour bouillon cubes contain the necessary salt). In addition to this hourly schedule of fluids, the patient may have unsweetened beverages if he desires them.

With the control of acetonuria, the indwelling catheter is removed, and the third stage ("Complications" on the chart) begins, lasting for two days in ordinary cases. In an effort to encourage carbohydrate tolerance the patient receives an *inadequate* caloric intake, divided into six equal feedings given every fourth hour day and night, accompanied by sufficient insulin to prevent glycosuria before the next feeding. The dose should be relatively uniform, but should gradually diminish as tolerance improves. In the face of complications, the problem of management are greatly simplified by continuing a similar schedule with *adequate* caloric intake, perhaps modified to four feedings given every sixth hour.

Although it is not directly a part of the subject of this paper, I have added to the chart data concerning the control of the otherwise normal diabetic, and this demands a few words of explanation. During periods of adjustment either in diet or in insulin dosage, it is well to collect the fractional urine specimens by the clock, as shown in the last column. If protamine zinc insulin is used, the dosage should be increased until there is no sugar in the overnight urine specimen, and then more accurately adjusted to attain a normal fasting blood sugar level. Postprandial glycosuria is to be expected under these conditions, but it is not generally considered disadvantageous. An additional bedtime feeding will permit increase in the dose of protamine zinc insulin without danger of early morning hypoglycemic reaction, and thus will tend to diminish such glycosuria after meals. If multiple doses of unmodified insulin are preferred, the fractional urine specimens during the day are much more important than the overnight specimen. In either case, the urine need not be checked daily after satisfactory control is attained, but should be checked routinely at least once a week, and of course immediately in the presence of any symptoms suggestive of ketosis and impending coma.

In closing, I should like to reiterate several conclusions which are particularly applicable to medical and hospital facilities in this state:

1) Confronted with the problem of diabetic coma, the duty of the first physician is to institute promptly and to maintain adequate treatment with insulin and saline, and not to be diverted by complex and unnecessary laboratory analyses.

2) Frequent analyses of urine taken directly from a free-draining indwelling catheter furnish simple and adequate guidance during the first few critical hours for the management of diabetic coma, unless persistent anuria is encountered.

3) The first stage of diabetic coma, characterized by unconsciousness and uncontrolled glycosuria, demands large doses of insulin every thirty minutes, continuous administration of parenteral saline, and the constant attendance of the physician. Only when glycosuria approaches extinction is glucose administration indicated, and then only in small amounts. Remember the tremendous impairment of insulin efficiency in the presence of ketosis: each gram of excess glucose requires from 10 to 20 units of insulin for its metabolism.

4) The second stage of diabetic coma, during which acetonuria persists, requires insulin and oral glucose every two hours, supplemented by salty hot bouillon on alternate hours.

5) The third stage of diabetic coma is the period of recuperation following the control of the acetonuria. Improvement in carbohydrate tolerance is encouraged by inadequate caloric intake. Management is greatly

simplified by giving equal feedings and insulin dosage every fourth hour day and night.

6) A similar schedule with adequate caloric intake, perhaps modified to four equal feedings every sixth hour, should be continued for the duration of the complications.

7) The average case of diabetic coma, in a clinic which discourages the use of glucose, requires 210 units of insulin and 5000 cc. of saline during the first twenty-four hours. Fatalities in our practice should be critically reviewed by these standards.

Abstract of Discussion

Dr. Richard Z. Query, Jr. (Charlotte): As has been pointed out, diabetic coma as a rule is precipitated by one of three factors: infection, dietary indiscretion, or too little insulin. Likewise, the mortality of patients in coma is affected by several factors. Age is very important. "Youth carries with it a great advantage." The death rate is around eight to nine times higher above the fourth decade than below the fourth decade. Impaired renal function is of bad omen. The prognosis is definitely worse with non-protein nitrogen above 40 mg. per cent. It is very important to get a non-protein nitrogen estimation along with the initial blood sugar and carbon dioxide combining power tests.

The importance of a careful search for infection has been mentioned. This cannot be stressed too much. Coma of long duration with a deep degree of unconsciousness has a very marked effect on the mortality and calls for more vigorous treatment. Diabetic coma, when severe and of long duration, usually results in vasomotor collapse, which increases the mortality. In one large series of cases the mortality was 40 per cent when the average systolic blood pressure was below 90 mg. of mercury.

All of the above mentioned factors should be carefully looked for, and if any are present the proper therapeutic measures as outlined by Dr. Smith, should be instituted.

Within the past two years, Rabinowitch, from the Montreal General Hospital, has written much on the use of protamine zinc insulin in diabetic coma. Most observers have felt that protamine zinc insulin with its slow prolonged action was unsuitable for treating coma. Rabinowitch is not in accord with this. His reports and studies are quite impressive in a rather small series of cases.

He gives 100 units of unmodified insulin intravenously, and 100 units of unmodified insulin and 200 units of protamine zinc insulin subcutaneously as soon as the diagnosis is assured. Fluids and supportive treatment as necessary are given. About five to six hours after administration of the insulin, small feedings of glucose, 30-40 Gm., are given every hour for a period of thirty to thirty-six hours.

He has treated 26 cases by this new method. The average blood sugar before treatment was 612 mg. per cent. It was reduced to 165 mg. per cent during an average period of five and one half hours.

He feels that there are certain definite advantages in this new form of treatment, while the advantages of the old method are retained. For example, the initial dosage of insulin is large. Too much stress cannot be placed upon this point. A person dying in diabetic coma is dying from lack of insulin. Insufficient dosage will almost certainly result in death, whereas, according to the literature, death from over-dosage of insulin in the treatment of coma is extremely rare.

Another advantage is the injection of unmodified insulin intravenously. This insures quick action of the insulin—another essential for recovery, particularly in severe cases.

A third advantage of this method of treatment, according to Rabinowitch, is that the administered carbohydrate enhances the storage of glycogen and thus rapidly reduces the degree of ketosis. Rapid disappearance of the ketone bodies is one of the characteristics of this new method of treatment.

Finally, the frequent feedings of carbohydrates practically eliminate the possibility of insulin reactions. He has not noticed a single reaction in his cases in spite of a persistent hypoglycemia for several hours.

Rabinowitch's mortality for this small group has been less than with the older method of treatment.

Dr. L. A. Crowell, Jr. (Lincolnton): I think Dr. Smith's paper is a very excellent one, and of high scientific value. However, I can't agree with the doctor so far as to say that we shouldn't use blood sugar determinations if it is possible in treating diabetic coma.

I have never thought that it was necessary to give glucose along with the insulin. The blood stream is loaded down with sugar and all you have to do is give insulin and make it available; and I don't know of any difference in the sugar in the blood stream which is made available by insulin and that which we give in the form of oranges. I think the best plan to follow in treating diabetic coma is just to treat every case individually and give as much insulin as it takes.

I am not so sure that the clinical symptoms in coma would be a safe guide as to when the patient comes out of coma, especially when the patient has been unconscious for twenty-four hours or more. I have seen two or three cases of coma where you couldn't tell the difference between a high blood sugar and a blood sugar at shock level. They pass by 100 mg. per cent without any lessening in the unconsciousness.

Dr. T. W. Baker (Charlotte): I agree with Dr. Crowell entirely that you cannot determine the ultimate prognosis of the patient by the height of the blood sugar or the depth to which it has fallen. I think there are some clinical considerations that are of more value, perhaps, in estimating the ultimate prognosis of the diabetic coma patient.

Several years ago I had the opportunity of studying 108 cases of diabetic coma in one of the larger clinics. We found there were four factors to determine the ultimate prognosis of the diabetic coma patient. Those were: (1) the age of the patient; (2) the degree of unconsciousness; (3) the presence or absence of infection; (4) the duration of coma before the institution of treatment. This is perhaps the most important clinical consideration. If we are able to get a patient who has been comatose less than six hours, the prognosis is usually very good; if over twelve hours, the prognosis is somewhat doubtful.

Dr. Verne S. Caviness (Raleigh): It is very easy to overlook the fact that coma is not necessarily or primarily a sugar metabolism disturbance. We are dealing very often with a circulatory failure as one of the principle factors in the production of the coma.

With reference to the long disputed argument as to whether or not coma can be treated without blood sugar tests, I think that as long as you are dealing with people who have a renal threshold of 170, which is normal, you will have no difficulty in

handling these cases. But we are not dealing with people of normal catabolism. I saw a patient quite recently with a renal threshold of 90. He had been treated in a very good clinic, and he stayed in shock most of the time because they were trying to treat him without doing any blood sugar test. Every time they would get the sugar out of his urine he would go into shock.

In contrast to that, I would like to refer to a patient I have had for many years—a physician whose renal threshold is 270. Now, if that patient goes into diabetic coma you can treat him with reasonable safety without much danger of his going on over into shock by keeping his urine sugar free.

I think the paper was very good, and I enjoyed it; but I think we need to be very careful in attempting to treat any coma without blood sugar tests.

Dr. O. Norris Smith (Greensboro): I want to thank these several gentlemen. Their points are certainly well taken, but my point is—and I still hold to it—that the treatment for the first few hours does not depend on the blood sugar level. The individual who is handling diabetic coma on the criteria of the glycosuria can safely give large doses of insulin until the glycosuria clears, at which time he slows it down a bit. That is the time when you have to check yourself and start making plans and changing the treatment.

The whole purpose of my paper was to get across —not to the men who are particularly interested in diabetes, who need no advice on the subject, but to the men who only occasionally see a diabetic coma —the simplified method, and at least to alter that conception of diabetic coma in the minds of many men who have not been exposed to the recent teachings.

ADDISON'S DISEASE

With Report of a Case

PAUL H. RINGER, M. D.
and
WILSON PENDLETON, M. D.
ASHEVILLE

"The leading and characteristic features of the morbid state to which I would direct attention are anemia, a general languor and debility, a remarkable feebleness of the heart's action, irritability of the stomach and a peculiar change of the color of the skin occurring in connection with the diseased condition of the suprarenal capsule." (Thomas Addison—1855).

A patient, Mr. X. Y., from New Jersey, aged 58, was first seen on February 17, 1940. He had consulted several physicians in the North and had been to White Sulphur Springs and to Palm Beach, in the hope that a change of climate would benefit him. In Palm Beach he was told that his lungs were worse, and so he came here. On arrival in Asheville, he was seen by one of us (P.H.R.), but no examination was made, as his report from Florida had not arrived. At that time he seemed quite normal mentally, though weak and emaciated physically. A few days later he became worse, was irrational and not easily controlled. He was then seen by W. P. and was admitted to the Asheville Mission Hospital on February 23, 1940.

His present illness began in July, 1939, with increasing fatigue and progressive loss of weight, and some nausea and vomiting. He had used very little alcohol and tobacco recently. He had a moderate cough with clear sputum, and marked dyspnea on exertion. He ran a slight afternoon temperature.

One brother had had tuberculosis, and died of coronary occlusion. At the age of 21 the patient was diagnosed as having pulmonary tuberculosis. He was sick for six or seven months, and went to Lake Placid, N. Y., where he recovered. He was well until 1917, when he developed a tuberculous laryngitis. He was in Asheville for three years, eventually making a complete recovery. In 1924 he had sciatica, lasting six weeks. In 1926 he had lumbago and was treated by diathermy. He had been working hard at the practice of law and as dean of a law school until the latter part of 1939.

Physical findings revealed a weak, emaciated man. There was some bronze pigmentation of the skin on the face, but none on other parts of the body. He had recently been exposed to the Florida sun. The teeth and gums were in poor condition. The pupils were normal. The lungs showed a few scattered rales, but nothing suggestive of a very active process. His blood pressure was 90 systolic, 60 diastolic. The abdomen was negative. The patient was incoherent, disorientated and very much confused. He seemed to have a fear of something unknown and a great desire to go home. He confused days, acts and personalities. An x-ray of the lungs showed a slight increase in bilateral involvement as compared with films taken in January, but the pulmonary process could not account for his condition.

On admission the urine was acid, and the specific gravity was 1.015, with a trace of albumin, and an occasional red blood cell and hyaline cast.

On February 24 a transfusion of 450 cc. of blood was given by Dr. W. P. Herbert, after which the red blood cell count was

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5,410,000, and the leukocyte count 13,150, with 42 per cent polymorphonuclears. A spinal tap was also done and about 3 cc. of fluid removed. The pressure was very low, and the fluid normal.

Several urinary examinations were made but they revealed nothing of moment. During his stay in the hospital the patient ran an irregular temperature with an occasional rise of a degree. Once or twice it rose over 100, and it reached a maximum of 101 the day before his death.

Because of the great loss of weight, asthenia, hypotension, and the rather peculiar color of the face (although this was not at any time characteristic of Addison's disease), it was believed that the man had an adrenal deficiency. He was given eschatin and sodium chloride, and the nausea and vomiting stopped. The highest blood pressure obtained was 100 systolic, 60 diastolic. The mental condition varied. Three days before death he was lucid the entire day, but as a rule he was very much upset mentally, showing the type of mental abnormality that one sees in delirium tremens. Carphologia was present, and the patient claimed that he saw animals and human faces on the walls and ceiling.

On the morning of March 7 he became very much worse, developed edema of the lungs, and died rather suddenly. A partial autopsy was performed an hour and a half after death by Dr. Curtis Crump, whose report follows:

"Well developed, moderately undernourished, elderly male. Skin shows brown diffuse pigmentation of head, neck and hands, but rest of body is of normal color. No deformities or tumors seen. Cranium and chest not examined.

"*Abdominal Cavity:* No free fluid. Stomach, intestines and colon normal. Liver shows slight passive congestion. Adhesions between gall bladder and duodenum.

"*Kidneys:* Both large—about 1½ times normal size—and red. Capsules adherent. Cortex thin. Pelves normal. The perirenal fat was fibrous.

"*Adrenals:* Right: Entire parenchyma replaced by caseous nodules which are adherent to the surrounding fat. It measures 6 cm. x 5 cm. x 3 cm.

"Left: Measures 4 cm. x 3 cm. x 2 cm. and shows a very small amount of parenchymatous tissue and a few moderate sized caseous nodules in the gland substance, also adherent to the surrounding fat.

"*Microscopic:*

"Kidneys: Tubules show granular degeneration of cells, with casts in lumen. The glomeruli and small vessels show passive congestion, some fibrosis and lymphocytic infiltration between the tubules.

Adrenals: Show large areas of caseation surrounded by lymphocytes, fibrosis and epithelioid cells. In other areas small tubercles are seen, with giant cells in the center. In a few places a small number of adrenal cells are seen, but they show granular degeneration (figs. 1 and 2).

"*Diagnosis:* Tuberculosis of adrenals.
Chronic tubular nephritis."

Discussion

Addison's original monograph describing the disease that bears his name is a monumentally interesting and far-reaching document. Not only did it, in 1855, describe a new clinical entity, but it focused medical attention on the ductless glands and their diseases. Addison's eleven cases are all well described, and in themselves constitute a text for the future study of the condition.

There is neither time nor need for a consideration of the various steps by which the treatment of Addison's disease has reached the present level. It is well to come at once to modern methods and to present briefly the present management of the disease, which rests on the following tripod:

1. Administration of sodium chloride
2. Restriction of potassium intake
3. Substitution therapy with extracts of the adrenal hormone.

Loeb was the one who introduced increased sodium chloride administration and restricted potassium intake in the treatment of Addison's disease. "He had been working for many years on the acid-base equivalent and the electrolyte structure of the blood. In taking care of patients with Addison's disease in the wards, the clinical condition in Addisonian crises suggested to him the possibility of Potassium poisoning. This led to investigation of the electrolyte patterns of these cases, which permitted the discovery of the altered Potassium-Sodium ratio with lowered Sodium and increased Potassium. This observation, in turn, suggested the use of Sodium Chloride in the treatment of Addisonian crises."[1]

1. Editorial, J.A.M.A., January 29, 1940.

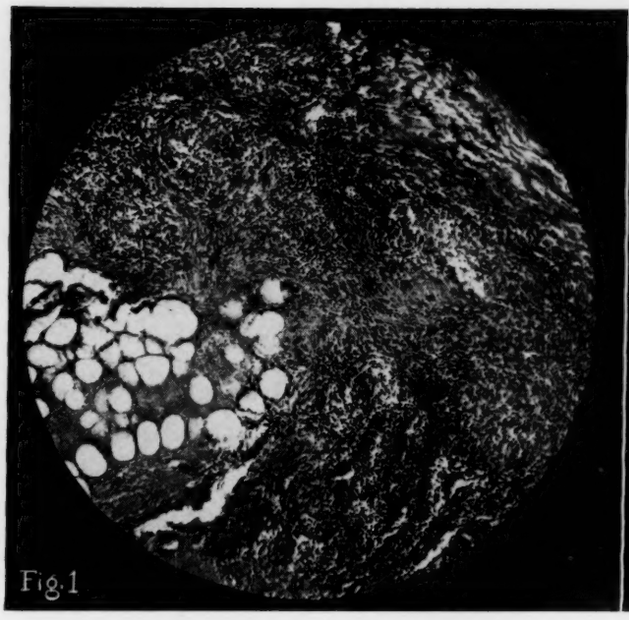

Fig. 1. Microphotograph of a section of the adrenals, low power.

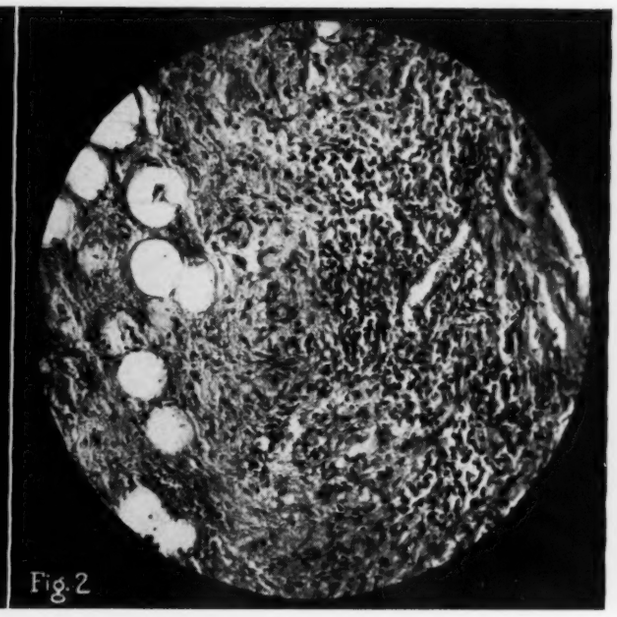

Fig. 2. Microphotograph of a section of the adrenals, high power.

In modern treatment, 5 to 10 Gm. of sodium chloride should be given daily in the form of tablets or capsules, while the general diet should be rich in salt. Rountree says that to rely on salt alone is to court disaster; but Dr. Hugh Morgan, of Vanderbilt University, told me that in the Vanderbilt Hospital they controlled their cases of Addison's disease very satisfactorily on high sodium and low potassium diets and only occasionally had to resort to substitution therapy.

Potassium Restriction:

1. Limit selection of bread, cereal and and sugars to the highly refined product.
2. Restrict moderately the use of milk, meats, fruits, vegetables, condiments and certain beverages.
3. Pending further investigation, cook meat and vegetables according to a special method whereby the content of potassium is reduced.

   Cut the vegetable into small pieces and cook in from six to eight times as much water as vegetable. This reduces potassium content 60 to 70 per cent, without a concurrent diminution in palatability.

   For cooking meat cut into small pieces and cook in a so-called parchment paper bag in from six to eight times as much water as meat. By this method the potassium content is reduced 75 per cent, while other nutrients and extractions which give flavor are retained in the meat.

Rountree says: "The treatment of Addison's disease during the last decade has undergone radical changes with the introduction of an active cortical hormone and the recognition of the importance of salt. Now, as always, emphasis must be placed upon adequate rest, warmth, control of activities and the avoidance of stress, strain, purgation and exposure to cold. Whereas formerly the management of this disease exhausted the therapeutic skill of the physician, today with the use of cortical hormone and a rich diet in salt, the patient may be relatively free of symptoms. Formerly the patient was more or less continually in a crisis, while now he is often a semi-invalid, or even a fairly active ambulant patient, capable of conducting considerable business."

For substitution therapy there are available two commercial products—cortin and eschatin. Their expense is a matter of importance. The cortical hormone of the adrenal gland, isolated by Swingle and Pfiffner, at present not generally available, is given parenterally in doses of 1 to 5 cc. daily; and desoxycocortecosterone acetate, discovered by Steiger and Reichstein in 1937, is injected in sesame oil in doses of 5 to 25 mg. daily.

It is stated by Rountree that the administration of this preparation is attended with some danger, and that a new method of ad-

ministration is under clinical trial by Thorn and collaborators—namely, the surgical implantation of pellets of this preparation in the fatty tissues at the back. This is continually absorbed, thereby supplying the hormone need of the patient over weeks and months.

Summary

We have presented the report of a case of Addison's disease in its terminal stages. With the autopsy findings, we do not believe that any method of treatment would have been of avail. We have tried to give briefly the present conception of the condition and of its management.

DERANGEMENTS OF THE LOW BACK WITH SCIATICA

HARRY WINKLER, M.D.

CHARLOTTE

Anatomy

In approaching the subject of low back derangements a brief review of the anatomy of the area may help us understand its problems more clearly. The spinal cord ends at about the level of the body of the second lumbar vertebra. The lumbar and sacral nerves are given off considerably higher in the cord than their point of emergence from the spinal column. Each nerve has a posterior root and an anterior one. These roots from the first lumbar nerve downward pursue a vertical course distally within the spinal canal and comprise the cauda equina. Each root pierces the dura mater separately; the anterior and posterior roots join immediately, and thereafter continue enclosed in a single tubular sheath in which is included the spinal ganglion of the posterior root. The spinal nerve thus ensheathed occupies the intervertebral foramen.

After emerging from the foramen the nerve immediately divides into an anterior and posterior branch. The posterior rami innervate the skin of the back and buttocks and the longitudinal muscles of the back, but not the muscles of the limbs.

The lumbosacral trunk comprises the whole of the anterior division of the fifth lumbar nerve and part of that of the fourth. It appears at the medial margin of the psoas major muscle and runs downward over the pelvic brim to join the first sacral nerve and unites with portions of the second and third sacral nerves to form the sacral plexus—a flattened band of nerve fibers—converging toward the greater sciatic notch. The greater portion of the plexus continues downward through the sciatic notch to form the sciatic nerve. It enters the gluteal region between the piriformis and superior gemellus muscles. It runs laterally and downward through the gluteal region in the hollow between the greater trochanter of the femur and the tuberosity of the ischium. The sciatic nerve is covered posteriorly by the gluteus maximus and emerges into the thigh below its inferior border. It usually terminates at the upper portion of the popliteal fossa by dividing into the common peroneal and tibial nerves. These two nerves are sometimes separated as far as their origin, in which case the common peroneal usually pierces the piriformis muscle.

The sciatic nerve supplies nearly the entire skin of the leg, the muscles of the back of the thigh and those of the leg and foot.

Pathology

With this picture of the anatomy before us we realize that from a mechanical standpoint there are many points along the course of the nerve where pressure or irritation can occur, which if unrelieved may cause sciatic pain. Within the spinal column herniation of a nucleus pulposus into the spinal canal may produce pressure on the nerve roots. Other types of tumor in this area include a thickened ligamentum flavum, cord tumor or a metastatic lesion.

At the intervertebral foramen there may occur many types of abnormalities which might lead to pressure on the spinal nerves or be responsible for pull or drag on the nerves. Arthritis is one of the most common causes, contributing either by direct pressure and irritation or by creating inflammatory and fibrositic deposits in the nerve sheath or neighboring structures. The intervertebral foramen may be the site of pressure because of diminution in its circumference (neurodocitis), edema from inflammatory reaction (arthritis, trauma, varicosities), or later scarring from some one of these causes with constricting bands and fixation.

Anomalies of the facets resulting in posterior luxation, abnormal mobility at the lumbosacral junction, the horizontal sacrum

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Read before the Section on Surgery, Medical Society of the State of North Carolina, Pinehurst, May 14, 1940.

and the acute lumbosacral angle, may produce either pressure or drag on the components of the sciatic nerve. Loss of the intervertebral disc may produce mechanical pressure at the point of emergence of the nerve by decreasing the size of the foramen.

Anomalies of the pedicle resulting in prespondylolisthesis or spondylolisthesis may at times produce mechanical drag or strain, particularly when there has been superimposed trauma or where there has been loss of muscle tone as a result of age or illness.

Enlarged transverse processes of the fifth lumbar vertebra may create an asymmetrical synostosis with the ilium and the sacrum, and produce an unstable low back with sciatic pain. It is interesting to observe that often the pain is on the opposite side from the impinging transverse process.

Within the past five years the work of Ober[1], Freiberg[2] and Heyman[3] has focused our attention on superficial lesions of the myofascial and aponeurotic structures as a contributing factor in sciatic pain. Pressure on the nerve as it emerges from the sciatic notch by the piriformis muscles, by a too tight gluteus maximus or even by contracture of the fascia lata may be the responsible producing agent.

Lesions of or about the sacro-iliac joint may reflexly affect the nerve. A tumor or swelling anywhere along the course of the nerve may be responsible.

It is Steindler's[4] contention that many cases of low back pain with sciatic radiation are purely reflex phenomena and are not due to direct pressure on the sciatic nerve except in cases of tumor, such as a herniated disc. He has devised a technique of novocain injection of certain "trigger points" which completely relieves the sciatic radiation and, in his opinion, differentiates those cases where the pain is due to direct pressure from those in which it is a reflex phenomenon.

Symptomatology

These patients present themselves with certain outstanding signs and symptoms which may have minor variations, depending upon the cause of the sciatic pain. A history of trauma not necessarily severe may lead one to suspect the possibility of a herniated disc. In the typical case of sciatica the chief complaint is pain down the back of the afflicted leg. The patient may be unable to extend his leg when lying in bed and prefers to keep the knee and hip flexed in an effort to obtain relief from his distress. He may carry the spine tilted to one side in an effort to obtain relief. At times the back pain is the chief complaint, with the sciatic radiation secondary, and occasionally paresthesias in the affected limb may be of significance. Sometimes the patient may describe a slipping experience in the low back which accentuates the pain. Coughing, sneezing or even evacuation of the bowel may affect the nature of the distress.

The radiation has been described as progressing from the hip to the knee, to the ankle or foot or to the great toe, or it may make its first appearance as a distress about the calf of the leg or in the ankle. In many instances the first history is of pain in the back, which gradually follows a downward course. In some instances the distress may be excruciating, requiring opiates to relieve it; in others, it may be well tolerated without sedatives.

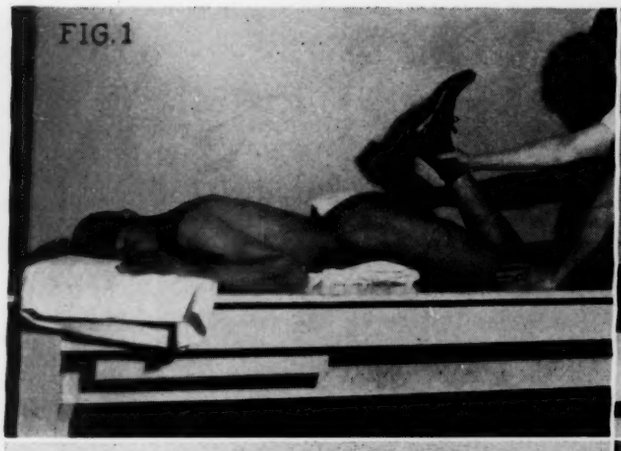
Diagnosis

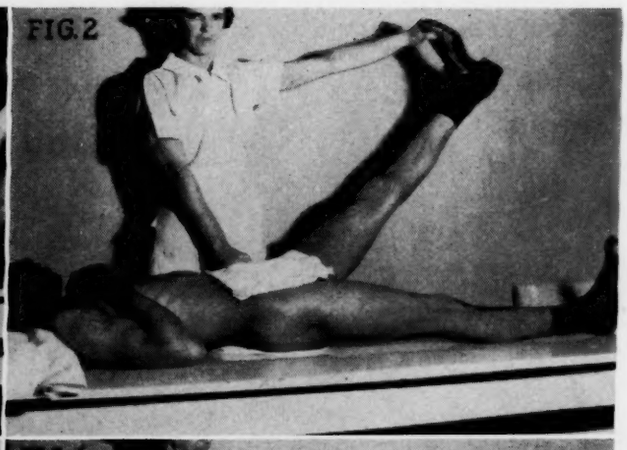
The diagnosis of sciatic pain is not a difficult one to make in an honest patient. The determination of its cause is, in many instances, one of the "unsolved problems" in medicine. The physical examination should be routine and thorough. Foci of infection are not within the scope of this paper, but must always be considered in the differential diagnosis, as must be consideration of the vitamin intake of the patient. The patient should be examined standing with good light. General posture, the appearance of the normal anatomical curves in the back, atrophy of the buttocks and leg, and abnormal curvatures of the spine should be noted. There may be limitation of forward or backward bending as well as tilting of the pelvis to the side. The patient should also be examined in the sitting position and any abnormalities noted. The back and spine should be carefully palpated for tender areas, as well as the thigh and buttock along the course of the sciatic nerve.

Certain signs and tests are valuable in making the diagnosis.

With the patient supine his response to

1. Ober, F. R.: Back Strain and Sciatica, J. A. M. A. 104:1580-1583 (May 4) 1935.
2. Freiberg, A. H.: Sciatic Pain, Arch Surg. 34:337 (Feb.) 1937.
3. Heyman, C. H.: Thoughts on the Relief of Sciatic Pain, J. Bone and Joint Surg. 16:889-894 (Oct.) 1934.
4. Steindler, A.: Differential Diagnosis of Pain Low in the Back: Allocation of Source of Pain by Procaine Hydrochloride Method, J. A. M. A. 110:106-113 (Jan. 8) 1938.





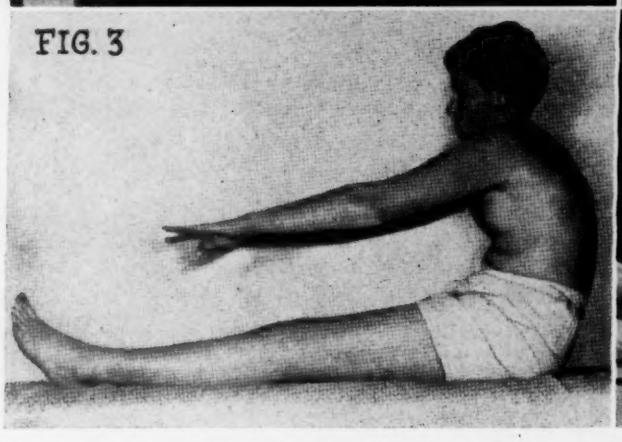


Fig. 1. Illustrating positive Eley sign.

Fig. 2. Illustrating positive Lasegue sign.

Fig. 3. Illustrating shortening of the posterior muscles, sitting. (From Ober, in the Journal of the American Medical Association, May 4, 1935.)

Fig. 4. Illustrating positive Ober sign.

the Lasegue test, (fig. 2) (raising the extended leg and observing and comparing the reaction of the two legs) is recorded. Frequently the exacerbation of the pain is extremely severe when this test is done. According to Ellis[5] the Lasegue sign is apt to be negative if the lesion is at the nerve root or funiculus—as, for instance, in cases of pressure from a prolapsed disc or funicular compression from intervertebral foramen changes—until a high degree of flexion of the leg is accomplished. It is likely to be positive soon after flexion of the hip begins in lumbar plexus lesions and sciatic trunk pathology. The sign is not however pathognomonic for all types of sciatica, and may be entirely absent in early or mild sciatica.

When the patient is asked to sit up from the supine position with the legs fully extended, if contracture of the fascia lata is present, he will be unable to flex to even a right angle (fig. 3).

In those cases with flexion contracture, Eley's sign (fig. 1) is usually present also and is demonstrated as follows: With the patient prone the leg is flexed on the thigh. The pelvis will rise from the table on the side the test is made when evidence of contracture of the fascia lata is present.

Ober[1] of Boston devised a test (fig. 4) wherein the patient lies on the unaffected side, with the lower leg partially flexed at the hip and knee. The affected leg is fully extended at the hip, and the flexed knee and leg allowed to rest in the examiner's hand. If the patient cannot then adduct the flexed knee, Ober regards it as evidence of contracture in the fascia lata which is probably mechanically responsible for the sciatic pain.

A rectal examination is of importance, and may reveal pathology which would otherwise be missed.

Finally a thorough neurological examination may show that the lesion is intraspinal and probably due to a ruptured intervertebral disc. Particularly in cases of chronic persistent sciatic pain unrelieved by therapy must this diagnosis be considered. Spinal puncture performed in the low lumbar spine

5. Ellis, Jno. D.: Examination of the Injured Back. Am. J. Surg. 42:561-575 (Dec.) 1938.

and using only the first 2 to 5 cc. of the spinal fluid content, is highly suggestive if the total protein content is in excess of 40 mg. per cc. The injection of iodized oil or air with fluoroscopic and roentgenographic studies will determine the diagnosis in these cases.

Spurling in a recent article[6] states that the diagnosis of ruptured intervertebral disc can very frequently be made by a careful neurologic examination. The Achilles reflex and a segmental sensory loss or impairment (dermatome area) are indicative of the location of the ruptured disc. The diagnosis, in his opinion, may be made accurately without the use of spinal puncture or lipiodol studies.

At the Mayo Clinic it has recently been determined that the displaced disc does not occur more than three times in a thousand pathological low backs with sciatic pain.

Thorough x-ray examination of the spine is of the utmost importance, and will in many instances reveal spondylolisthesis, arthritis, posterior luxation and many other abnormalities of the lumbosacral articulation which may be the cause of or a contributing factor in the sciatic pain.

A recent review of the films taken in 100 cases of sciatic pain showed x-ray findings of arthritis or some type of congenital abnormality in over 80 per cent of them.

Treatment

Treatment varies, depending on the assembled information following the completed diagnostic studies. The milder cases which are due to postural defects usually respond to corrective exercises, heat and immobilization of the low back by strapping or belts. Temporary and sometimes permanent relief is accorded by injections of saline and novocain into the epidural space, and this may be added to the above therapy. It is often both wise and economical to make hospital cases of these patients. Firm beds, Buck's extension to the involved limb and plaster girdles have been used with success in these controlled cases.

Sectioning of the iliotibial band, as advocated by Ober, has been done in an increasing number of cases in our work. Stretching of the extended leg while under anesthetic combined with the Ober sectioning has come to be a rather routine procedure where the sciatica is intractable and the Ober and other tests are positive. We have not used the stripping operation of Heyman, nor the piriformis muscle sectioning advocated by Freiberg, because of the relative simplicity of the Ober sectioning and its reasonable success in our hands. Removal of the herniated nucleus pulposus should be done where the diagnostic studies point to this type of pathology, and this operation is safest in the hands of a competent neurosurgeon. Spine fusion for correction of low back abnormalities, together with iliotibial band sectioning, may be indicated. Ober feels that even in cases with an apparently unstable, painful low back, contracted iliotibial bands should be sectioned before performing spine fusions.

We have performed sectioning of the iliotibial band in approximately 75 cases of low back derangements with sciatica. Some of these are too recent to determine the permanency of the relief obtained. For this paper, however, a questionnaire was sent to 40 of these patients who had had fasciotomies one or more years ago. Replies were received from 26. All 26 had received relief. Twenty of them were completely well and able to carry on their usual occupations. The remaining six were well of their sciatic pain, but complained of some numbness in the affected leg or occasional back pain. Those 6 patients, though, felt that they had received definite benefit from the operation.

Summary

Cases of low back derangement with sciatica seem to appear with increasing incidence. The answer to this may be poorer muscular development, which fails to compensate for weakness in the anomalous spinal column. These patients need careful x-ray, clinical and laboratory studies, including a careful neurological examination.

Some cases may be due to nutritional deficiencies; they may be of infectious origin; or they may be due to a mild postural defect. These respond to conservative treatment. Other cases may prove quite intractable and require hospitalization and treatment for a longer period and of a more radical character.

The displaced or herniated intervertebral disc must be considered in a certain number of cases of sciatic pain, but the incidence of displacement is comparatively low.

6. Spurling, R. G. and Bradford, F. K.: Neurologic Aspects of Herniated Nucleus Pulposus, J. A. M. A. 113:2019-2022 (Dec. 2) 1939.

We have found that sectioning of the iliotibial band, together with manipulation of the involved leg where the Ober and other signs indicate definite contracture of the fascia lata will give a high percentage of cures in derangements of the low back with sciatic pain.

BACTERIAL ENDOCARDITIS DUE TO THE STREPTOCOCCUS VIRIDANS; RECOVERY FOLLOWING SODIUM SULFAPYRIDINE THERAPY

EDWARD S. ORGAIN, M. D.

and

MARY A. POSTON, M. A.

Bacterial endocarditis, regardless of the etiologic organism, is regarded generally as a serious and usually fatal disease[1, 2]. This is particularly true of streptococcus viridans endocarditis, in spite of the optimistic reports by some[3, 4, 5], and the demonstration of healed endocarditis by others[6, 7]. Prior to the advent of chemotherapy in the form of sulfanilamide and its related compounds, a wide variety of substances, particularly the chemical dyes, arsenical compounds, vaccines, and immunotransfusions were tried, but none has merited general therapeutic approval. Since the advent of sulfanilamide and its derivatives there have been a few reports of marked improvement[8, 9, 10, 11], and one instance of recovery[12] following the exhibition of these drugs. More recently heparin in conjunction with sulfapyridine[13] has been utilized in bacterial endocarditis with encouraging results in the initial cases.

For the past two years a special study of all cases of bacterial endocarditis admitted to Duke Hospital has been made by the authors, and since recovery from this disease is unique, we feel it worthwhile to report one instance of Str. viridans endocarditis, superimposed on a previously damaged rheumatic heart, wherein complete recovery followed the intravenous, rectal, and oral administration of sodium sulfapyridine. We wish to emphasize the type of treatment administered, and the importance of special blood studies, which we have found very helpful in the determination of recovery from this disease.

Case Report

History. H. W., a white, 29 year old male farmer, entered Duke Hospital on April 5, 1939, complaining of anorexia, weight loss, joint pain, palpitation, dyspnea and precordial distress. His family, marital and past histories were essentially non-contributory, except as detailed below.

His health had been good until April, 1927, when an acute attack of migratory polyarticular arthritis, typical of rheumatic fever, required bed rest for three months. Frequent recurrences of mild joint pain were noted during the ensuing four years. He first entered Duke Hospital on December 8, 1931, for one week of observation, complaining of weakness, palpitation and dyspnea for several months. Physical examination revealed fever, tachycardia, moderate cardiac enlargement, mitral systolic and diastolic murmurs, an aortic diastolic murmur, Corrigan pulses, and a blood pressure of 126 systolic, 40 diastolic. Blood counts indicated a mild anemia and moderate leukocytosis. A blood Wassermann test was negative, and a blood culture was sterile. An electrocardiogram showed partial heart block (P-R interval .25 sec.), and left axis deviation. Teleroentgenogram revealed marked left ventricular enlargement. The following diagnoses were made: Acute rheumatic fever,

From the Department of Medicine and the Department of Bacteriology, Duke University School of Medicine and Duke Hospital, Durham.

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2. Levine, S. A.: Clinical Heart Disease, Philadelphia, W. B. Saunders Company, 1938.
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4. Libman, E.: A Further Report of Recovery and Recurrence in Subacute Bacterial Endocarditis, Tr. A. Am. Physicians, 48:44, 1933.
5. Capps, J. A.: Subacute Bacterial Endocarditis Due to Streptococcus Viridans with Special Reference to Prognosis, Ann. Int. Med. 13:280-293 (August) 1939.
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rheumatic carditis, active, with cardiac enlargement, and mitral and aortic insufficiency. Bed rest at home and salicylate therapy were advised at the time of discharge.

The patient returned on April 5, 1939, complaining primarily of anorexia and weight loss. During the interval he had led a "chair-bed" existence, and had noticed fleeting joint pains, with gradually increasing exertional dyspnea. He remained fairly well, however, until November, 1938, when he had a febrile illness, manifested by fever, chills, delirium, unconsciousness, and a skin rash, which was diagnosed as "scarlet fever." Hospitalization was required for one week, and treatment consisted principally of blood transfusions. He felt that he had never recovered from this illness, and until the time of admission there had been progressive anorexia, weakness, palpitation, fleeting joint pains, precordial discomfort, dyspnea, and loss of 10 pounds of body weight. During the two weeks just prior to entry, pain in the fingertips was noted. He had been aware of intermittent mild febrile periods, but there had been no definite chills.

Physical Examination. The temperature was 37.5°C., the pulse rate 80, the respiratory rate 16, and the blood pressure 135 systolic, 40 diastolic. The patient appeared to be a chronically ill, slender, young white man, who exhibited definite mental retardation. The skin showed a fine erythematous rash over the thorax. No petechiae were seen in the skin or mucous membranes at entry, but several developed in the conjunctivae during the first few hospital days. The spine was slightly kyphotic. The cervical glands showed moderate enlargement, but there was no generalized lymphadenopathy. The eyes were normal except for systolic pulsations easily visible in the retinal arterioles. The nose was normal. The teeth were dirty and carious, with gingival retraction and pyorrhea. Small tonsillar tags were present in both fossae. Marked systolic pulsations were noted over the carotid vessels. The thorax was slender; the lungs were clear, except for a few rales at both bases. The heart was markedly enlarged to the left, the apex being visible and palpable in the sixth intercostal space, 12 cm. from the midsternal line. At the apex the first sound was accentuated, and was followed by a soft, blowing systolic murmur. An early diastolic murmur transmitted from the base, and a low-pitched, rumbling, mid and late diastolic murmur localized at the apex, were audible. Over the base the aortic second sound was accentuated, and there were soft systolic and loud diastolic murmurs. The diastolic murmur was early, high-pitched and was transmitted down the left border of the sternum to the apex. The rhythm was regular. The peripheral vessels were not thickened; the pulses were typically Corrigan in type. The abdomen was essentially normal, except for the spleen, which was felt just beneath the left costal margin. Genital and rectal examinations were normal. The extremities were grossly normal. The reflexes were physiological.

Laboratory Data. The hemoglobin was 13.3 grams (86 per cent), the red blood cell count was 4,560,000, the white blood cell count was 7,150, with 79 per cent polymorphonuclear leukocytes, 1 per cent eosinophils, no basophils, 5 per cent monocytes, 5 per cent large lymphocytes, 10 per cent small lymphocytes. The color index was .94. The sedimentation rate was 28 mm. per hour, corrected. A blood Wassermann test was negative. Repeated urinalyses were negative, except for an occasional white blood cell on microscopic examination. A throat culture showed only Str. viridans. Fluoroscopy and teleroentgenogram showed the heart to be larger than when previously examined, particularly in the region of the left ventricle, which was rounded in shape. Pulsations were vigorous. The aorta was dilated and slightly tortuous. The lung fields were clear. The cardiac measurements were: right border 3 cm., left border 14 cm. from the mid-sternal line; total 17 cm.; great vessels 8 cm.; internal diameter of the chest 27.5 cm. An electrocardiogram showed partial heart block, without dropped beats, P-R interval .3 sec., left axis deviation consistent with left ventricular hypertrophy, distinct notching of P 2, inversion of T 2 and T 3; the precordial lead was normal.

Course in the Hospital. The patient was placed at complete bed rest, given fluids as desired, and a high caloric, high vitamin diet, supplemented with iron, liver extract, and blood transfusions. During his first week in the hospital he was afebrile, except for the first hospital day, when his maximum temperature was 38.1°C., and six consecutive blood cultures, taken at daily intervals, were positive for Str. viridans, the colony count varying from 4 to 26 colonies per cubic centimeter of blood. During the first few days, he developed petechiae in the conjunc-

tivae, and one large purpuric spot with soreness and tenderness in the tip of the right index finger.

On April 11 (seventh day) he was given 4 Gm. of sodium sulfapyridine intravenously (5 per cent solution in distilled water), without reaction, except for slight nausea. The blood concentration taken four hours later was 5.5 mg. per cent, and 8 hours later was 4.1 mg. per cent. On April 12 (eighth day), a second dose of 4 Gm. was given intravenously, which produced nausea and vomiting during the administration of the drug. The vomiting lasted for a few minutes, and the nausea for several hours. The blood concentration taken four hours after the end of drug administration was 8.2 mg. per cent, and seventeen hours later was 3.7 mg. per cent. On April 13 (ninth day) 10 Gm. of sodium sulfapyridine were given intravenously. During the administration of the drug the patient became nauseated and vomited, and toward the end of the injection period, muscular twitchings began, involving the face, neck and upper extremities, later progressing into a generalized convulsion, with extreme cyanosis, and long periods of apnea. He was given coramine and morphine; the convulsion lasted 20 minutes, and the muscular twitchings continued for a period of six hours. The cyanosis gradually disappeared. Blood taken immediately after the termination of the drug injection showed a concentration of 43.5 mg. per cent, and CO_2 combining power of 72 volumes per cent. Four hours later the blood sulfapyridine was 15.7 mg. per cent, and seventeen hours later 9.6 mg. per cent. By the following day the patient had entirely recovered from his drug reaction, except for continued nausea.

A blood culture taken following the second intravenous injection of the drug was sterile, and repeated blood cultures taken twice to three times weekly thereafter (a total of 25) were sterile. On April 14 (tenth day) the rectal administration of sodium sulfapyridine in 5 per cent solution was begun in doses of 20 Gm. daily, divided evenly every six hours. The blood concentration varied from 6.3 to 9.9 mg. per cent. The rectal dose was raised to 24 Gm. daily, and continued for a total of fifteen days. It was discontinued, because of declining blood concentrations, and evidence of rectal irritation. On April 17 (thirteenth day), the fourth day of rectal therapy, the patient developed fever, the temperature rising to 38.5 C., and an erythematous rash appeared over the entire body, with some edema of the lips. This was considered a definite drug reaction. The rash disappeared in seventy-two hours, but the temperature persisted for one week. Sulfapyridine therapy was discontinued for one day, and potassium chloride was given in doses of 3 Gm. three times daily. On April 25 (twenty-first day) oral administration was combined with rectal administration, and after three days rectal administration was discontinued. Oral doses of 8 to 11 Gm. per day in divided doses at 6 hour intervals were given throughout the remainder of his hospital stay. Under oral administration of the drug, nausea and vomiting were quite variable from day to day, later disappearing entirely, in spite of continued exhibition of the drug.

The patient remained afebrile, and slow improvement, noted after the first two weeks in the hospital, progressed throughout the remainder of his stay. By April 28 (twenty-fourth day), the seventeenth day of therapy, the hemoglobin had fallen to 66 per cent, and the red count to 3,490,000 cells, in spite of three blood transfusions of 500 to 600 cc. each, given during this period. The white count, which on admission was 7,000 cells, varied from 5,000 to 12,300 cells. After six additional transfusions, varying from 250 to 500 cc. each, the hemoglobin rose to 90 per cent, and the red cells to 4,630,000. The hemoglobin fell to 83 per cent, and the red cells to 4,170,000 at the time of discharge. The blood concentrations during oral administration varied from a low of 2.7 mg. per cent to a high of 17 mg. per cent.

The drug was discontinued on June 3 (sixtieth day), after fifty-two days of therapy, and the patient was allowed to be up and around for one week before his discharge home. He improved remarkably in his general feeling of well being; his appetite increased; and he gained 12 pounds in weight. The white count showed remarkable variability throughout his period of improvement, and was 9,400 at the time of discharge. Sedimentation rate, which was 28 mm. per hour on admission, reached normal (9 mm.) on May 9 (thirty-fifth day). It rose during the next 10 days to 12, 14, and 15, but by May 23 (forty-ninth day) it was 11 mm., and remained normal thereafter. We regard the sedimentation rate as one of the most accurate indices of infection.

Serial electrocardiograms showed no

significant changes, except for decrease in P-R interval to .21 sec. Teleroentgenogram revealed a decrease of .5 cm. in the transverse diameter of the heart. The patient was discharged on June 10, 1939 (sixty-seventh day), feeling well. His cardiac findings were unchanged, but the spleen was no longer palpable.

Examination of his immunologic status is of interest. Serial studies of opsonocytophagic power of the blood, agglutinins, and bactericidins were done once weekly throughout his hospital stay. Three control studies, done prior to the beginning of drug therapy, showed minimal phagocytosis, but no agglutinins nor bactericidins were present. By April 21 (seventeenth day) phagocytosis was increased; agglutinins appeared in a serum dilution of 1:40; and bactericidins were present in the undiluted serum. By May 19 (forty-fifth day), thirty-eight days after the beginning of therapy, phagocytosis was complete; agglutinins were present in a serum dilution of 1:5,120; and bactericidin tests revealed complete inhibition of organism growth in a serum dilution of 1:1,000. On June 9 (sixty-sixth day) phagocytosis was still complete; agglutinins were present in a serum dilution of 1:20,480; and bactericidins in a serum dilution of 1:1,500.

The patient returned for examination on July 12, 1939, feeling perfectly well, having gained an additional 10 pounds in weight. Complete physical examination revealed nothing of importance, except for the cardiac findings, which were identical with those at the time of discharge. His blood findings were within normal limits. An electrocardiogram showed evidence of partial heart block, the P-R interval being .23 sec. Immunologic studies revealed phagocytosis diminished, agglutinins present in a serum dilution of 1:5,120, and bactericidins in a serum dilution of 1:1,200. A blood culture showed no growth.

He was seen again on September 15, 1939, three months after discharge, feeling quite well. The routine blood counts, including sedimentation rate, were all normal, and a blood culture was negative.

He returned again on April 26, 1940, having been well, except for a rather prolonged respiratory infection, apparently a common cold, with secondary bronchitis and pleurisy. He had lost 6 pounds in weight, but had had no fever nor chills. He had been doing light work around his farm. There were no changes in his physical examination. His blood findings were normal, except for sedimentation rate of 20 mm. per hour. X-ray of the chest showed no change over the previous teleroentgenogram. The electrocardiogram was unchanged, except for P-R interval of .24 sec. A blood culture was still negative; phagocytosis was much reduced; agglutinins were present in a serum dilution of 1:640; and bactericidins were absent.

The patient was last seen on June 20, 1940, one full year after discharge, having been entirely well, except for several mild episodes of precordial pain immediately after his previous visit. He had continued doing light work at home. No changes from his previous physical findings were noted. The blood findings were still normal, except for sedimentation rate of 20 mm. per hour. The electrocardiogram was unchanged. A blood culture was sterile. Phagocytosis was complete; agglutinins were present in a serum dilution of 1:5,120, and bactericidins in a serum dilution of 1:1,000.

Discussion

There is no doubt that this patient had Str. viridans endocarditis, involving the aortic and possibly the mitral valves of a heart previously damaged by rheumatic fever. The history of recurrent rheumatic fever and the presence of aortic insufficiency seven years previous to his last admission to the hospital formed the clear background for the development of bacterial endocarditis. Bacterial endocarditis was suggested historically by malaise, weight loss, intermittent febrile periods, and pain in the fingertips; and physically by the appearance of chronic illness, fever, petechiae, aortic insufficiency, enlargement of the spleen, leukocytosis, and active sedimentation rate. These findings, together with six consecutive blood cultures positive for Str. viridans and the evidence of peripheral embolization, were considered absolutely diagnostic of bacterial endocarditis. Clinical recovery under sodium sulfapyridine therapy was evidenced by general improvement in the patient's condition, gain in weight, the subsidence of fever, leukocytosis, and sedimentation rate, and the appearance of immune antibodies (opsonocytophagic power of the blood, agglutinins, and bactericidins) in the blood. It is particularly important that clinical evidence of recovery has been maintained throughout one full year of frequent complete physical and laboratory examinations.

Two points deserve special emphasis and discussion. First, recovery, initially manifested by the disappearance of the bacteremia, followed the use of large doses of sodium sulfapyridine intravenously (4 to 10 Gm.) wherein an unusually high blood concentration was attained (43.5 mg. per cent), and maintained at a satisfactory level (15.7 mg. per cent after four hours; 9.6 mg. per cent after seventeen hours), for a period of many hours. It can not be stated with any degree of certainty whether or not the patient was cured following the largest intravenous injection (10 Gm.), but recovery was progressive under continued exhibition of the drug rectally and orally. It seems possible from *in vitro* experiments*, using the patient's organism and sodium sulfapyridine, that sufficient bacteriostasis and perhaps bactericidal effect may have been produced by a maintained high blood concentration to enable recovery to follow. Such therapy, however, is obviously dangerous, and certainly inadvisable, except under strict and constant observation.

The second point to be emphasized is that the recovery phase of this patient was accompanied by the appearance of immune antibodies, which increased progressively to reach significantly high levels by the time of discharge. We feel that the determination of these antibodies gives important and supportive evidence of the patient's recovery, when, after initial negativity, they appear in the blood stream and reach a high titre. Such evidence of immunity apparently is maintained over a period of many months. The sharp rise in immune antibodies at the time of his last visit may have been due to antigenic stimulation, caused by a recent respiratory infection.

Conclusion

A case of classical Str. viridans endocarditis, involving the aortic, and possibly mitral valves, of a heart previously damaged by rheumatic fever is reported in detail, with particular emphasis upon therapy and immunologic data. Recovery, maintained for a period of one full year, followed the use of sodium sulfapyridine, intravenously, rectally, and orally.

* Unpublished data.

We wish to express our thanks to Dr. David T. Smith for his valuable advice in the treatment of this patient, and to Miss Sara Bunch, of the Department of Biochemistry, who performed the blood sulfapyridine determinations. The drug, sodium sulfapyridine, was very generously supplied to us for experimental use by the Calco Chemical Company of Bound Brook, New Jersey.

SUBTOTAL GASTRECTOMY FOR MEDICALLY TREATED, NON-RESPONDING GASTRIC AND DUODENAL ULCER: WITH PRELIMINARY CASE REPORTS

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The primary treatment for ulcer is medical, and except in an emergency, the patient should have the benefit of a thorough medical treatment before surgery is resorted to. Only about 8 per cent of cases of duodenal and about 23 per cent of cases of gastric ulcer should come to operation[1]. Surgery is indicated in those cases in which the medical regimen has failed. Cases with persistent pain, cases that have had two or more gross hemorrhages, cases with perforating ulcers or pyloric obstruction not amenable to medical treatment, and cases of gastric ulcer in which malignancy is suspected should be referred to surgery. There is also in some cases an economic reason for operation.

By subtotal gastric resection I mean the removal of at least two-thirds of the entire stomach. It is upon this, as stressed by Finstrer, that the success of the operation depends.

After observing and talking to quite a number of patients who had had subtotal gastric resection for gastric and duodenal ulcer, months and years before, I became thoroughly convinced that this operation has distinct advantages over gastroenterostomy for the future health and comfort of the patient. Judging from the literature, this conviction seems to be rapidly growing in America.

In 1881 at the University of Vienna, Billroth did the first gastric resection, for carcinoma of the stomach. This was the beginning of successful gastric surgery. Prior to 1906 few gastric resections had been done for ulcer. In 1906 gastric resection for ulcer was done on a fairly large scale in Europe, and in the past few years such operations have been done in steadily increasing numbers in the United States.

Finstrer[2], who was Billroth's assistant

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1. Lahey: Experiences With Gastrectomy, Total and Subtotal, New England J. of Med., 220:315 (February 23) 1939.

2. Finstrer: Class Lectures, 1936.

during his later years, began resecting for ulcer in 1916. He states that resection of a small portion of the stomach is ineffective, because the hyperacidity is not controlled, and a new ulcer, often gastrojejunal, may be formed.

In the beginning Finstrer used ether anesthesia, and his mortality was 14 per cent. After he adopted local and splanchnic anesthesia his mortality dropped to 3½ per cent. There were fewer deaths from pneumonia and none from so-called "operative shock", which he claims is a progressive weakness from prolonged general anesthesia. He also found that peritonitis was more common following general anesthesia than after local and splanchnic, and it was his opinion that the prolonged ether anesthesia partially destroys the power of the peritoneum to resist infection.

The explanation of the large percentage of failure in gastroenterostomy done for ulcer is: first, that the pathological lesion is left in the body; and second, that hyperacidity, a chief factor in ulcer, is not corrected. Furthermore, with the ulcer left *in situ*, there is danger of perforation, of hemorrhage, of failure to heal, and of malignancy. Approximately 20 per cent of gastric ulcers undergo malignant degeneration, and it is well to bear in mind that there are more deaths from cancer of the stomach than from cancer of any other part of the body. There is also the danger that a vicious cycle will be established—that food will pass through the pylorus, into the duodenum, and back through the gastrojejunostomy into the stomach and out through the pylorus again. The cases which come to autopsy show a highly dilated duodenum and efferent loop and a contracted small afferent loop.

Finstrer reports 90 per cent of cures following gastric resection for ulcer. In Europe cures are reported in 40 per cent of gastroenterostomies for ulcer.

The probable reason for the low mortality reported by some men in gastroenterostomy and the much higher mortality reported in resection is that gastric resections are done only in the severe cases.

After a gastric resection the patient has symptoms of a small stomach for about four months, after which time these symptoms disappear.

Gastrojejunal ulcers occur both after gastroenterostomies and after gastric resections, but Finstrer's statistics show occurences in 30 per cent of cases after gastroenterostomy and in only 9.4 per cent after resection.

It is dangerous to operate for a gastrojejunal ulcer, whether following a gastroenterostomy or a gastric resection.

Finstrer[3] reports a series of 331 such cases, with a total mortality of 11.7 per cent. Gastric resection for gastrojejunal ulcer following gastroenterostomy shows a lower mortality (6.8 per cent) than when it follows gastric resection (23.5 per cent). Therefore he concludes that a gastric resection is indicated at once if symptoms return in a patient after gastroenterostomy, but it is to be delayed if they return after gastric resection until medical therapy has been given a thorough trial.

From 1928 to 1938, 960 ulcer patients were seen in the Bellevue Clinic[4]. Many of these had previously been operated on and were having a recurrence of symptoms due either to the original ulcer or to complications from the operation. Eighty-eight and four tenths per cent had duodenal ulcer; 11.6 per cent had gastric ulcer. Eleven per cent of the 690 duodenal cases not previously operated on were referred for operation. Persistent and severe pain was the chief indication for operation. In 1933 a review of 106 cases showed that only 24.5 per cent were cured, only 29.2 per cent were improved, and 46.2 per cent were unimproved. Thus nearly one half of the patients subjected to gastroenterostomy had found their conditions unchanged or worse. Of this group 18.8 per cent had definite signs and 7.5 per cent had questionable evidence of gastrojejunal ulcer. As a consequence of the unfortunate results, since 1933 subtotal gastrectomy instead of gastroenterostomy has been done in all chronic duodenal ulcers requiring operation. The mortality in primary resection was 5.1 per cent.

Cutler[5], reporting a fourteen year period at the Roosevelt Hospital, shows a mortality in gastric resections of 9.3 per cent, which compares favorably with his mortality of 8.5 per cent for gastroenterostomy during the same period. With gastroenterostomy there were late poor results in 16 per cent

3. Finstrer: Results of Repeated Operations on Stomach, J.A.M.A. 112:1871 (May 6) 1939.
4. Hinton and Maier: Chronic Duodenal Ulcer, Ann. Surg. 3:348, March, 1940.
5. Cutler: Treatment of Peptic Ulcer, J. A. M. A. 111:653 (August 13) 1938.

of his cases; with resection, only 3 per cent of his cases had late poor results.

Lewisohn[6], reporting statistics from the Mount Sinai Hospital, states that 18 per cent of their gastroenterostomies had already been re-operated upon for gastrojejunal ulcer, and another 16 per cent had a return of symptoms, making a total of 34 per cent of cases unsatisfactory. This agrees with statistics from other clinics. Considering this high percentage of unsatisfactory results after gastroenterostomy for ulcer, it seems wise to look for some other surgical approach to those cases in which medical treatment has failed.

Lewisohn also reports a series of gastric analyses done at the Mount Sinai Hospital on a number of patients who had had gastroenterostomy and on an equal number who had had gastric resection for ulcer. Only 4 per cent of the gastroenterostomy cases showed an anacidity, and in the vast majority of cases the postoperative acidity was no lower than before operation. Seventy-five per cent of the resection cases showed free hydrochloric acid below 10. It is interesting to note that eight patients included in this series of cases had been subjected to gastric resection for gastrojejunal ulcers following gastroenterostomy. After the gastric resection all of these cases showed a complete absence of free hydrochloric acid. Before the resection the free hydrochloric acid of these patients varied between 19 and 68. This is a very clear demonstration of how subtotal gastric resection produces anacidity in individuals in whom gastroenterostomy had failed to do so.

Jura[7] reports on the blood picture of 20 patients following gastric resection. He found that the red blood cells and the hemoglobin are diminished during the first two weeks following resection, after which they slowly increase to almost normal. He believes that the diminution of red cells and hemoglobin after resection is due to lack of the intrinsic factor of Castle in the gastric secretion and to the diminished capacity of the remaining portion of the digestive tract to absorb iron. He further believes that the slow but progressive increase of red cells and of hemoglobin is due to vicarious hematopoietic function of the digestive tract, especially of the duodenum and the small intestine. He states that the improvement of the blood picture after gastric resection is spontaneous. His patients did not receive any treatment for control of anemia. It is advisable, however, to institute certain medical measures after resection to aid in a quicker and better absorption of iron by the body and to stimulate the anti-anemic reaction of the remaining segments of the digestive tract.

What about the motor functions of the stomach after gastric resection? In a paper published in 1940[8], Vitkin discusses 74 patients who had had gastrectomies between 1930 and 1936. His conclusions were as follows: (1) As a rule the stomach after subtotal gastrectomy shows a rhythmic evacuation. (2) At present there are no data which would substantiate the belief that a sphincter is formed in the anastomotic region after gastrectomy, and he considers the formation of such a sphincter quite impossible. He claims that the periodic closure and opening of the anastomosis is due to peristaltic contractions and distentions of the efferent intestinal loop nearest to the anastomosis. (3) Gastric tone after partial gastrectomy becomes normal in time; and a stomach which was hypotonic or atonic at the time of operation becomes normal in tone following gastrectomy. (4) Spasms of the anastomosis after gastrectomy undertaken for cancer present an early symptoms of the recurrence of cancer in the region of the anastomosis. (5) After gastrectomy most patients exhibit a hyperplastic gastritis and a chronic jejunitis without any clinical manifestations. (6) Normal evacuation of the stomach is resumed after gastric resection.

Technique of Operation

In discussing the technique of operation it will be important to emphasize a few *don'ts*. Don't use clamps where it is possible to do without them; clamps traumatize all layers of the stomach and intestine and lead to complications such as hemorrhage, separation of the suture line, leakage, delayed healing, and marginal ulcers. Where it is imperative to use a clamp, use one which exerts as little pressure as possible to make your technique safe. Don't have undue tension on the suture line. This invites poor healing, slough, leakage, peritonitis, and death. Don't make a jejunojejunostomy in connection with your

6. Lewisohn: Problems in the Surgical Treatment of Chronic Duodenal Ulcer, Ann. Surg. 3:355, March, 1940.

7. Jura: Erythrocytosis After Gastric Resection in Duodenal Ulcer, J.A.M.A. 110:987 (March 19) 1938.

8. Vitkin: Motor Functions of the Stomach After Resection, Ann. Surg. 3:27, January, 1940.

gastric resection, because: (1) satisfactory function is obtained without it; (2) it is an additional technical step, time-consuming in character, with an added risk of leakage; and (3) in subtotal gastrectomy for ulcer, a jejunojejunostomy is physiologically undesirable, because a large portion of the alkaline jejunal contents are thus sidetracked below the stomach and do not return to the stomach to accomplish acid neutralization. Don't use non-absorbable suture material on the mucosa; it predisposes to marginal ulcer. Don't use the Billroth I operation; there is too much tension on the suture line, and two tubes of different calibres are anastomosed. Probably the best type of operation for subtotal gastric resection is Finstrer's modification of the Billroth II.

Case Reports

While these cases are too few and too recent for any definite and permanent conclusions to be drawn from them, I thought they might be of interest in connection with this paper.

Case 1. A. S., a white male aged 35, was admitted to the hospital on April 30, 1939. His chief complaint was pain in the upper abdomen for the past sixteen years, which came about two hours after meals and was usually followed by vomiting. Temporary relief was obtained by food or milk. The patient was in the hospital for the same condition five years ago, but had been no better since. The patient was a tall slender male. On examination some tenderness was found in the epigastrium. A gastric analysis showed the fasting free hydrochloric acid to be 0, the total acidity 10. After an Ewald meal the free hydrochloric acid was 53, the total acidity 75. The Kahn test was negative. There were 5,480,000 red blood cells, and the hemoglobin was 88 per cent. The x-ray showed the stomach to be normal in size and contour; the pylorus and duodenum were well drawn up into the region of the gall bladder. There was marked irregularity of the duodenal cap caused by adhesions, probably an old duodenal ulcer. The x-ray report made five years previously read: "The duodenum was well visualized, and showed a persistent deformity, of the cap, which could not be filled out by palpation, probably a duodenal ulcer."

On May 20, 1939, under pontocaine spinal anesthesia the patient was operated upon. There was found a prepyloric ulcer with an indurated area of about 1 inch around it, and a duodenal ulcer on the posterior wall of the duodenum near the pylorus. A subtotal gastric resection was done. The abdomen was closed in layers without drainage. On the fifth postoperative day the patient had more fever than was to be expected. This was explained by the development of a subphrenic abscess, which was opened and drained nine days later. The temperature fell to normal on the day following this operation, and remained so until the patient's discharge from the hospital, when he was in good condition.

On April 3, 1940, ten and one-half months after operation, the patient could eat a full diet without any pain whatsoever. He stated that he had had no pain since leaving the hospital. He eats only three regular meals a day, and weighs 153 pounds—1 pound more than he ever weighed in his life, and 16 pounds more than he weighed at the time of operation. He had not received any antianemic treatment since leaving the hospital; yet his red cell count was 5,280,000, and his hemoglobin was 98 per cent. A gastric analysis was done. The fasting specimen showed free hydrochloric acid 0, total acidity 20. After an Ewald meal, the free hydrochloric acid was 20, the total acidity 40. The patient is doing regular farm work.

Case 2. J. M. A., a male aged 39, was admitted to the hospital on December 4, 1939, as an emergency case. He had had severe epigastric pain, nausea and vomiting for the past seventy-two hours, and had vomited some blood three times. For four years he had had a burning in the epigastrium, which was relieved temporarily by food, soda, and milk. He gave a history of having tarry stools and having lost weight. He was acutely ill, in severe pain, with tenderness in the epigastrium. A diagnosis of gastric ulcer with hemorrhage was made. He was given enough morphine to keep him quiet. On the fifth day after admission a gastro-intestinal series was done which revealed on the lesser curvature of the stomach an unusually large niche, anterior to which was a marked filling defect. This was interpreted as a large gastric ulcer with a suggestion of malignant degeneration. On the eighth day after admission the red cell count was 5,000,000, the hemoglobin 98 per cent. On the tenth day after admission a subtotal gastric resection was done. A huge gastric

ulcer had extended through all layers of the stomach, and the posterior wall of the stomach was adherent to the pancreas. Resection by Finstrer's modification of the Billroth II method was done. The abdomen was closed without drainage. Pathological examination showed a non-malignant ulcer and non-malignant glands removed from the lesser curvature. The patient's temperature came to normal on the second postoperative day, and remained there. His convalescence was entirely uneventful. He was up in a chair on the fourteenth day, and was discharged on the twenty-first postoperative day. Three months later he looked well, and said he was feeling fine, eating anything he wanted to, and had had no pain in his stomach since the first two or three days after his operation.

Case 3. T. P. R., aged 40, a male, was admitted to the hospital on March 27, 1939. His chief complaint was pain in the epigastrium, vomiting and belching. Fifteen months previously he had had an operation for perforated gastric ulcer; the perforation was closed. He got along fairly well for the first five months after operation, but for the past ten months he had had much pain in his stomach, had vomited frequently, and had lost 36 pounds in weight. He had not vomited blood.

The urine contained albumin (1 plus), a few granular casts, and a few white blood cells. The Kahn test was negative. The red cell count was 5,650,000, the hemoglobin 90 per cent. A gastric analysis, fasting specimen, showed free hydrochloric acid 10 per cent, total acidity 45 per cent. After an Ewald meal the free hydrochloric acid was 40 per cent, the total acidity 67 per cent. The x-ray report was as follows: "The stomach is low, and of increased capacity; peristalsis is very active. The duodenal cap shows a filling defect. At the duodenal junction on the inner side is a small niche, which is persistent, showing a perforating ulcer. A six hour film shows a large amount of gastric retention." The facts of increased peristalsis, marked gastric retention, and persistent vomiting over a period of ten months would point strongly toward pyloric obstruction, and the operation for perforated ulcer fifteen months previously made it almost conclusive. Under pontocaine spinal anesthesia a subtotal gastric resection was done. A prepyloric ulcer was found, with an enormous amount of induration, and pyloric obstruction. The abdomen was closed without drainage. The patient made an uneventful recovery.

Microscopic examination showed an acute ulcer superimposed upon an old chronic one. There was no evidence of malignancy. A year later the patient had gained 36 pounds, was back at work, and was eating anything he wanted with no pain.

Summary

1. Peptic ulcer is primarily a medical disease.

2. A certain percentage of ulcers are refractory to medical treatment, and they become surgical cases.

3. Gastroenterostomy for ulcer has been very disappointing as regards permanency of cure.

4. Subtotal gastric resection is the best surgical method at our disposal. It reduces the acidity, relieves the patient of many years of suffering, protects him against the serious complications of perforation and hemorrhage, and effects a permanent cure in about 90 per cent of cases.

5. The success of resection as a permanent cure depends upon the removal of a large portion of the stomach, which produces a very low acidity and removes the pathological lesion from the body.

6. The best type of operation is Finstrer's modification of the Billroth II, under local or spinal anesthesia.

Abstract of Discussion

Dr. R. L. Pittman (Fayetteville): While I agree with much of what Dr. Benbow says, at the same time I feel that we enjoy that thing we call our stomach a great deal and we don't like to be separated from too much of it at one time.

I would like to defend, to some extent, the gastroenterostomy as performed today by a great many men. I feel that it relieves a great many of these cases, and certainly the mortality is not as high as for gastrectomy.

I have performed gastrectomies only in obstructive conditions of the pylorus involving extensive ulcers, in possible early malignancy, and in one particular type of ulcer—that is, ulcer on the lesser curve of the stomach in a young person who has, over a long period of time, failed to respond to medical treatment. In those patients, I do feel we get better results by complete resection of the ulcer with a portion of the stomach from the lesser curvature to the greater curvature. The motor activity of the stomach seems to be better than when the ulcer is excised and a gastroenterostomy done.

For a general rule, excision of the stomach, or of a considerable portion of it, seems to me to be a rather extensive operation for ulcer of the stomach. However, I am willing to accept Dr. Benbow's evidence as he so ably presented it. I enjoyed his paper and appreciated it very much.

Chairman Rose: Is there further discussion of Dr. Benbow's paper?

Since there is not, Dr. Benbow, we will ask you to close the paper.

Dr. E. V. Benbow: With regard to the mortality of subtotal gastrectomy, it runs very little higher, if any, than that of gastroenterostomy. The reason some people have a high mortality in the resection cases is that they don't do a gastric resection until a man is at death's door. If they will do resections on those same cases that they now do gastroenterostomies on, the mortality will be very little higher. In general, the mortality is not over 5 per cent. Cutler reports a mortality of 9.3 per cent in his gastric resections. He also reports 8.5 per cent for gastroenterostomy, so they run pretty close. They both run a little high, but you can figure on about a 5 per cent mortality if you take the run of cases which come to you.

COMMON COMPLICATIONS OF PREGNANCY

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It is impossible in a rather limited time to discuss in detail such a broad topic as "Complications of Pregnancy." This paper will not deal with the rare conditions, but will be confined to the common complications which the general practitioner frequently encounters. However, any physician who undertakes the care of maternity cases should remember that every case which he accepts is potentially subject to any of the complications of pregnancy.

Prophylaxis, of course, is of first importance. Unfortunately, many of the complications of pregnancy are at present unpreventable, however, much can be done if one keeps in mind the most probable complications during the various stages of pregnancy, and, should they appear, treats them from their very onset.

Usually the first and most common complication of pregnancy is vomiting. The cause of this is still unknown. It has been classified into reflex, neurotic and toxemic types. The reflex theory will be dismissed by stating that local irritative conditions have proved to be coincidental rather than causative. Williams and his group at Hopkins have long held that a large percentage of these cases are neurotic or psychic in origin. Some cases certainly seem to fall in this group. At the present time, however, the vast majority of writers on the subject agree that some form of toxemia causes the vomiting of pregnancy. Until more is learned about this toxemia, we can only treat the effects of the vomiting—acidosis, dehydration, etc.—rather than the vomiting itself. Fortunately, most of these cases are mild and can be controlled by a high carbohydrate diet and the use of sedatives an hour or so before eating. Chloral hydrate exerts a local anesthetic action on the gastric mucosa, and is probably more efficacious in this condition than the bromides or barbiturates. Rest is of value, especially at the time the patient is nauseated. Proper bowel function should not be forgotten, and here the diet also plays an important part. When fruits, especially prunes, fail to accomplish this, the combination of mineral oil and cascara, or some other mild laxative should be resorted to. In the more severe cases bed rest is essential. Sedatives should be increased and preferably given per rectum, with the elimination of all oral intake. When such becomes necessary large amounts of glucose should be given intravenously, with one-half unit of insulin for each gram of glucose. The hypodermic or intravenous administration of an ampule of corpus luteum once or twice daily seems to help most of these cases, although some prominent obstetricians still question the value of its use.

In those cases which appear to be psychic or neurotic in origin the introduction of the duodenal tube and the feeding of liquids through this tube will prove beneficial.

If, after three to six days of intensive treatment, a severe case does not improve, therapeutic abortion is indicated, especially if there is fever, a rapid pulse or jaundice.

Vaginal bleeding is a frequent complication of pregnancy during the first trimester. It may be physiological, but it is more often the first symptom of an ectopic pregnancy or an abortion. Occasionally the first symptoms of a ruptured ectopic pregnancy are rather dramatic, with pain, shock, and fainting. It rarely has a rapidly fatal termination. More often, however, the pain is less severe, with slight atypical vaginal bleeding and dizziness, followed by a pelvic discomfort. In a few days there is another attack of pain and dizziness, or perhaps fainting due to internal bleeding. This bleeding from the ruptured tube is usually continuous, but it is rarely so severe that the patient's life is in immediate danger. At this time, or

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soon afterwards, pain may be referred to the shoulder girdle or rectum. Usually when there is a pint or more of blood in the abdomen shifting dullness can be demonstrated by percussion over the lower abdomen. When there is slow bleeding from the ruptured tube the blood coagulates in that region of the cul-de-sac, and in such cases a pelvic mass can usually be felt on careful bimanual examination. An extremely tender cervix is a valuable point in the diagnosis of a ruptured tube when acute salpingitis can be eliminated. Sedimentation rates and blood counts may be the same in the two conditions, but the examination of smears taken from the cervix and Skene's ducts will usually clarify the situation.

An early abortion must also be considered in the differential diagnosis of ruptured tubal pregnancy with vaginal bleeding. When vaginal examination fails to establish the diagnosis a curettage may be necessary. But one must remember that a tubal pregnancy and a uterine pregnancy may occur at the same time, 294 such cases having been reported in the literature to date[1]. Two such cases have occurred in the Lowrance Hospital during the past five years, and these have not been reported.

The treatment of tubal pregnancy with rupture or abortion is of course surgical.

The most common major complication of pregnancy is no doubt abortion. It has been estimated that one out of every three or four pregnancies terminates in abortion. Quite a few of these are criminally induced. The other causative factors are numerous, and in many cases it is impossible to find the cause. Locally, lesions such as fibroids or endometritis may be blamed. A diseased cervix, a retrodisplaced uterus or an ovarian cyst will occasionally be a factor. Trauma is frequently held responsible, but seldom does it seem to be the sole or chief cause. In many instances the embryo has not developed properly. Debilitating diseases, especially the chronic ones, account for their share. Endocrine deficiencies no doubt play a definite role; this is particularly true as regards hypothyroidism. Vitamin E deficiency no doubt plays a definite part in many spontaneous abortions.

The symptoms of abortion are vaginal bleeding, which may be alarming if the pregnancy has advanced to three months or more; and pains in the lower abdomen and back, with history of amenorrhea. With this history, our first considerations should be whether it is spontaneous or induced, threatened or inevitable, complete or incomplete, aseptic or septic. When the type is determined, treatment must be instituted accordingly. In threatened abortion the rule should be absolute rest in bed three or four days after all pain and bleeding have ceased. Progesterone and morphine should be given to allay all uterine contractions and to keep the patient quiet. Wheat germ oil, which has proved so valuable in habitual abortion, should be given in large doses. No vaginal examination should be made unless abortion appears to be inevitable, as indicated by hemorrhage. In the inevitable aseptic cases with hemorrhage and in the clean incomplete cases, curettage should be done under the most rigid aseptic precautions, remembering always that the pregnant uterus is easily punctured with sound or curette. An ampule of pituitrin injected deeply into the cervix at the beginning of any intra-uterine manipulation will lessen the danger of perforation and of hemorrhage.

In the treatment of septic or infected abortion sound judgment is required. If the infection seems to be severe and is comparatively recent in origin, conservatism is indicated. All text books warn against interference until the temperature has been normal three to five days. However, if the cervix is open and the contents are readily accessible, experience has proved it practicable and safe to evacuate gently the intra-uterine contents; and here the fingers are safer than any instrument.

Sulfanilamide and repeated small blood transfusions are of course indicated in practically all cases of septic abortion.

A few words should be said about tuberculosis complicated by pregnancy, for in recent years there has been a change in the method of handling these cases. Pregnancy in tuberculosis is not an infrequent occurrence, since the incidence of tuberculosis in women is highest during the childbearing age. It was formerly taught that abortion should be done on all pregnant women with active tuberculosis. This therapeutic measure was based on empirical knowledge, and not on the information that is now available. Recent investigators, in reviewing more than 30,000 cases[2] could find no case of pulmonary tuberculosis which proved to be ag-

1. Bernstein, Abraham, in Am. J. Surg., March, 1940.

2. Buford, C. F., and others, in J. Missouri M. A. 36:108-118, March, 1939.

gravated by pregnancy. Of course proper obstetrical care, with the continued treatment of the tuberculosis, is indicated. The reasons why tuberculosis patients do well during gestation are:

1. All the physiological processes function at their best during pregnancy.

2. As the size of the gravid uterus gradually increases, the intra-abdominal pressure is increased. This in turn results in the splinting of the diaphragm together with an elevation. As a result favorable changes in the size and contour of the chest take place. After labor, however, when the diaphragm suddenly descends and expands the lungs again, there is danger of reactivating this relatively quiescent tuberculous process. This effect can be adequately modified or prevented by artificial pneumothorax, pneumoperitoneum or a phrenic operation immediately following labor.

Another significant complication of pregnancy is pyelitis. Though it occurs in only about 4 per cent of all pregnant women, it often results in permanently damaged kidneys. The degree of the damage is proportional to the severity and duration of the infection. True uncomplicated pyelitis seldom exists; it is practically always a pyelonephritis. The diagnosis of this condition is usually easy, but occasionally with a blocked ureter, catheterization of the ureter is essential to arrive at the true cause of the fever, which may or may not be associated with chills. Urinary symptoms and pain over the lumbar region are usually, but not always present. The treatment consists of rest in bed, plenty of fluids, free elimination, a light diet and the use of knee-chest position (if possible) two or three times daily. Urinary antiseptics are very helpful, but only when there is function and fairly adequate drainage from the involved kidney. When possible the causative organism should be isolated and identified by culture. Only in this way will the patient derive the maximum benefit from the newer and more potent urinary antiseptics. We are hardly justified in using the trial and error method of finding out which of the urinary antiseptics will be more effective. Urotropin with acid, however, may be given from the beginning. It is inexpensive and often effective. When practical and convenient, cystoscopy with ureteral catheterization should be done. Carefully performed, this procedure should not be feared as a possible cause of abortion. In the milder cases the pelves are usually irrigated and the catheters withdrawn. In the more severe cases it is better to leave the catheters in for twenty-four hours and irrigate every three or four hours. In chronic or recurrent cases of pyelitis the preparation and administration of an autogenous vaccine will occasionally result in a cure when all other therapeutic measures have failed. In rare instances, however, when careful and intensive treatment fails, therapeutic abortion must be performed.

Appendicitis may be a rather serious complication of pregnancy. Fortunately more than 80 per cent of the reported cases occurred during the first six months of pregnancy when diagnosis and treatment presents less difficulty. The symptoms of appendicitis occurring during the first trimester are comparable to those occurring in the non-pregnant woman. It must be remembered that as the uterus enlarges there is a gradual upward displacement of the cecum and appendix, so that they may eventually lie under the liver. Leukocytosis is a variable manifestation of uncomplicated pregnancy, and is therefore an unreliable index to the degree of inflammation of the appendix during pregnancy. The thinning of the abdominal musculature during the latter part of pregnancy makes rigidity a less reliable sign. This thinning of the abdominal wall does, however, make tenderness more significant, and the diagnosis is best made by this one sign.

The only rational treatment of acute appendicitis with pregnancy is appendectomy. Other conditions such as ectopic gestation and twisted adnexal tumors may be confusing, but these also require operation. Postoperatively, adequate doses of morphine should always be given to forestall labor when any inflammation has spread beyond the appendix. Postoperative labor has little or no effect on the healing of the well sutured McBurney incision.

The association of heart disease and pregnancy may present a serious situation. Pregnancy certainly increases the work of the heart, and during the last trimester this increase is estimated to be around 50 per cent. Only in this way, however, does pregnancy affect the diseased heart. No one has ever been able to demonstrate that pregnancy itself is able to cause any exacerbation of rheumatic heart disease. Therefore, as a rule, it is safe to say that if a patient

feels no cardiac embarrassment while doing light work, however loud or rough the murmur may be, pregnancy will not impose serious trouble if she follows adequate rules for care during pregnancy. Her activities should be adjusted to her capacity; and infection, especially colds, should be treated with the greatest of care. However, should decompensation occur during late pregnancy a real risk may be encountered during labor. If such cases do not respond to treatment interruption should be seriously considered. If the patient seems to have strength to stand delivery from below, this is preferable; but the use of forceps to aid her is definitely indicated. If decompensation does not improve under treatment, or becomes worse, cesarean section under local anesthesia probably offers her the best chance.

During the last trimester of pregnancy hemorrhage offers the most formidable of all the complications of the gestational period, and must be treated with precision and promptness. One should not only check bleeding but should prevent later complications such as shock and infection. Placenta previa and premature separation of the normally implanted placenta may occur at any time during the last trimester. Placenta previa is diagnosed by the sudden onset of painless vaginal bleeding, seemingly without cause. The initial attack of bleeding is rarely fatal. The shock is in proportion to the amount of visible blood lost. It is difficult at times to determine the type of placenta previa, whether it is lateral, marginal, or central. Especially is this true with an undilated or partially dilated cervix. Vaginal examination in such cases is a hazardous undertaking unless done under the most rigid aseptic precautions. Be prepared before any examination to combat hemorrhage by packing or by immediate cesarean section. Have the patient typed for transfusion and have the donors immediately available. At the present time cesarean section is the best method of procedure, and as a rule should be done as soon as the diagnosis of placenta previa is made. Occasionally, in a multiparous woman with slight bleeding and dilated or dilatable cervix, rupture of the membranes with or without insertion of a hydrostatic bag will suffice. Also in an occasional case when the baby is small and the cervix is soft and somewhat dilated, an immediate version will be necessary and preferable to a section. A Braxton Hicks version is not indicated if the baby is alive, but may be done if the fetus is dead and the cervix half dilated. It is well to keep in mind that any intra-uterine manipulation increases the blood loss, shock and infection. There is also danger of rupturing the lower uterine segment if version is attempted.

Premature separation of the normally implanted placenta is a dangerous condition. At times it is seen during labor, and it is frequently not suspected until the patient is in shock. If the onset is during labor the only symptom may be expulsion of small clots during pains. The onset of most cases is rather sudden, with constant labor-like pains, fading fetal heart sounds, and board-like rigidity of the uterus, with or without visible hemorrhage. Some degree of shock is usually present, and is out of proportion to the visible blood lost. There is usually a history of some recent trauma, and often a history of toxemia. One should especially be concerned if there is a history of nephritis. In such cases anuria and uremia are likely to occur, and early treatment should be instituted to combat these.

The treatment of premature separation is immediate delivery by cesarean section, in practically all cases except those in which the separation occurs late in the first stage of labor. In these cases simple rupture of the membranes and prompt delivery is sufficient. If the fetus in the second stage of labor is in distress, as evidenced by the fetal heart rate, version may save the baby and the mother. Premature separation before the onset of labor, or early in the first stage, may mean the loss of the baby and probably the loss of the mother, or may necessitate the removal of the uterus because of the infiltration of blood into the uterine wall with the loss of contractility and subsequent postpartum hemorrhage. If premature separation of the placenta is recognized early the maternal mortality should be slight; however, if treatment is not begun until late, many patients will die despite the best treatment that is at present available.

The so-called late toxemias of pregnancy are the most thoroughly investigated but probably the least understood of all the complications of pregnancy. There is still no unanimity of opinion as to the classification of these toxemias. In a workable classification the so-called toxemias may be, divided into the acute, non-convulsive (pre-eclamptic) and the convulsive (eclamptic) toxemi-

as. The entire syndrome develops in the course of pregnancy, and is distinct from the chronic cardiovascular-renal conditions with which the woman was affected prior to the pregnancy.

In recent literature there have been many hypotheses as to the cause of the toxemias of late pregnancy. None are generally acceptable, and they will not be discussed. We do know that in eclampsia and pre-eclampsia, angiospasm is a common pathogenic factor underlying all the varying expressions of eclampsia. This vascular manifestation is at first functional, but if it lasts too long the small vessel walls become thick and sclerotic. This occurs not only in the kidneys, but in the liver, brain and other organs as well.

From various statistics it appears that clinical evidence of pre-eclampsia occurs in about 10 per cent of the child-bearing population at large. With treatment, however, not more than 2 or 3 per cent of these will have eclampsia.

It is sometimes difficult to distinguish between pre-existing chronic general vascular sclerosis, or chronic nephritis, which may complicate pregnancy, and the acute toxemias which make their appearance in the latter months of pregnancy. A non-pregnant woman may have mild chronic nephritis, and yet all the blood examinations and kidney function tests will be normal. Should such a woman become pregnant, she will show hypertension and albuminuria before the third trimester; whereas acute toxemia rarely manifests itself before the seventh month. In this time element lies a reliable and practicable means of differentiating between the two conditions. It is unfortunate that mild chronic nephritis cannot always be diagnosed before the onset of pregnancy—not even by the technical urea clearance test and the Addis count.

Treatment: Those patients who exhibit no symptoms of nephritis or hypertensive disease before pregnancy, but who in early pregnancy exhibit a mild degree of hypertension (around 140 systolic and 90 diastolic), who have at most a trace of albumin, and whose renal function is within normal limits, may be treated expectantly; however, there is danger that the existing condition will be aggravated by superimposed toxemia.

A woman who shows more hypertension and more albumin during the early months of pregnancy may be carried on to term, but irreparable damage to her kidneys, with shortening of her life, is to be expected. Kuder and Stander[3] found that more than 40 per cent of women died within ten years after chronic nephritis was first recognized in the course of pregnancy. It appears, therefore, that if the disease is manifest at conception, abortion should be done promptly. If the disorder has been latent and appears early in pregnancy and is associated with considerable albuminuria which tends to increase despite treatment, it is unlikely that pregnancy can terminate successfully. If to albuminuria is added edema or hypertension the pregnancy should be terminated without delay.

The treatment of pre-eclampsia is at present more effective than formerly. It consists essentially in adequate elimination, mild sedation, bed rest and dietary restrictions. Sodium chloride should be cut down to a minimum, and only vegetable and milk proteins should be allowed. For the milder cases the diet may consist of skimmed milk, fruits, vegetables and salads; for the more severe cases only sweet fruit juices should be allowed. McIlroy[4] and other British obstetricians gave as their opinion that a diet sufficient in vitamins, especially vitamin D, and inorganic constituents, such as calcium, iron and iodine, is vital in preventing and treating pre-eclampsia. All agree that high carbohydrate diet, including if necessary frequent intravenous injections of hypertonic glucose and the administration of magnesium sulphate intravenously to the severely sick patients, give excellent results. However, if treatment fails to cause improvement, termination of the pregnancy is indicated. To induce labor in these cases conservative methods are preferable to cesarean section.

Despite adequate prenatal care and every known method of treatment of pre-eclampsia, true eclampsia may occur and may be fatal. Eclamptic convulsions present an immediate emergency which calls for active but not radical treatment. Therapy should be instituted to control the convulsions and to relieve the edema and promote diuresis. Here hypertonic glucose, frequently administered, has its greatest usefulness. It not only dehydrates but protects the liver and prevents the development of dangerous acidosis. For the purposes of sedation, morphine, chloral hydrate, and the barbiturates have all proved effective. The intravenous use of magnesium

3. Kuder, K., and Stander, H. J., in New York State J. Med. 34:5, 1936.
4. McIlroy, L., in Lancet, 2:391, 1934.

sulphate is an important part of the conservative treatment of eclampsia. In addition to its sedative effect it relieves edema and promotes diuresis. McNeille[5] has given 20 cc. of a 10 per cent solution intravenously every hour for as many as six doses with excellent results. It is the concensus of opinion, however, that this drug should be given with caution when oliguria or anuria is present.

Current writers seem to have little favor for venesection as a treatment of eclampsia. However, should pulmonary edema develop, venesection, atropine and oxygen should be employed—as well as 50 per cent glucose intravenously.

As to the termination of pregnancy in the eclamptic patient experience has shown that all methods of delivery are inadvisable until the convulsions have been controlled. Even then forceful mechanical means of emptying the uterus should be avoided when possible. Plass[6] in a collective review, found the mortality following radical treatment of eclampsia to be 21.7 per cent of 4,607 cases and only 11.1 per cent of 5,976 cases in which treatment was conservative.

Summary

Only the more frequent and more significant complications of pregnancy have been discussed. These include vomiting of pregnancy, tubal pregnancy, abortion, pyelitis, heart disease in pregnancy, placenta previa, premature separation of the placenta, and the late toxemias of pregnancy. It should be noted that the trend is more and more toward keeping the pregnant woman in a state of physiological equilibrium by encouraging the use of a high vitamin diet and one which contains the essential inorganic constituents. This appears to lessen the incidence of many of these complications, or at least to lessen their severity. The active treatment of such complications is directed not only toward eradicating the complication itself, but always toward keeping the physiological processes as near to the normal state as possible. Much progress has been achieved in both the prevention and treatment of the complications of pregnancy, but vast strides are yet to be made before any pregnant woman can be assured that on the expected date of confinement she will have a live baby and that everything will go well.

5. McNeille, L. G., in J.A.M.A. 103:548, 1934.
6. Plass, quoted by Dieckman, W. J., and Michel, H. L., in Arch. Int. Med. 55:420, 1985.

TUMOR OF THE ACOUSTIC NERVE

With Case Report

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Tumors originating from the acoustic nerve are neither rare nor unusual. The case we are reporting has several unusual points. Most of the tumors of this group occur in individuals under 50 years of age. Our patient was 71. In the differential diagnosis we had to consider senile arteriosclerosis—the cerebral condition which can simulate almost any organic brain lesion. We begin by frankly admitting that we missed the diagnosis. The second thing of interest was the unusually high protein content of the spinal fluid. The figures as given by Merritt and Fremont-Smith[1] are from 150 mg. to a top normal of 500 mg. per 100 cc. With the kind permission of Dr. Merritt, and the W. B. Saunders Co., we are reproducing a chart showing the protein content of the lumbar cerebrospinal fluid in 182 cases of cerebral tumor (fig. 1).

Case Report

Mr. L. L. C., aged 71, a white male, was first seen on May 8, 1939, complaining of pain in his legs and weakness. From the histories obtained by the different consultants, it was apparent that this man had definite mental deterioration. The history varies in each instance, but it seemed from his statements that about two years previously he began to develop marked unsteadiness on bending forward. About that same time he noticed tinnitus in both ears and an occasional stumbling in his gait. He also noticed that his hearing was progressively becoming worse; this impairment was slightly more pronounced on the right than on the left. There had been rather rapid loss in hearing during the last two months. Approximately one month previously he noticed a weak and trembling feeling in his legs, some increased unsteadiness in his gait, and

NOTE: The photomicrographs appearing in this article were made by the U. S. Army Medical Museum, Washington, D. C.

1. Merritt, H. Houston, and Fremont-Smith, Frank: The Cerebrospinal Fluid, Philadelphia, W. B. Saunders Co., 1937, p. 162.

Location & Type of Tumor	Lumbar cerebrospinal fluid content (mg. per 100 cc.)					
	Under 45	45-100	100-200	200-500	500-1500	Total
Supratentorial						
Glioma of cerebral hemisphere	23	27	15	5	1	71
Glioma of third ventricle	0	1	0	1	1	3
Glioma of corpus callosum	0	4	0	3	0	77
Meningioma	4	7	4	0	0	15
Metastatic and other tumors of cerebrum	10	13	5	2	0	30
Pituitary and suprasellar tumor	2	3	0	0	0	5
Subtentorial						
Acoustic neuroma	0	2	3	11	0	16
Other cerebellopontine angle tumors	2	1	2	1	0	6
Glioma of cerebellum or fourth ventricle	12	7	3	1	0	23
Glioma of brain stem	3	2	0	1	0	6
Total	56	67	32	25	2	182
Per Cent	31	37	17	14	1	100

Fig. 1. The protein content of the lumbar cerebrospinal fluid in 182 cases of cerebral tumor.

a tendency to fall. If he stopped suddenly while walking — especially while walking rapidly—he would fall forward. He had been having some cramps in the calves of his legs. He had also noticed noises in his head, which he described as bell-like or like the roaring of a train. There was no history of diplopia, nausea, or vomiting. In fact, except for "constipation" and "prostate trouble", the rest of the history was negative. The patient denied all venereal diseases.

Physical examination showed a blood pressure in each arm of 155/95. The skin was rough, due to an ichthyosis. The pupils were small, but reacted normally to light. There was some irritation of the conjunctiva of the right eye. Ocular movements were normal. Hearing was somewhat reduced in both ears. All teeth had been removed except one above and six below. The tongue was moderately coated and was protruded in the midline. The tonsils were small, with red pillars. There was no adenopathy nor abnormal pulsations in the neck. The veins of the neck were rather full, especially on the left side. Chest expansion was fair and equal. The percussion note was normal throughout. The diaphragm moved normally; no rales or frictions were heard; breath sounds were vesicular. The supracardiac dullness in the second interspace was 3.5 cm., and in the third interspace was 4.5 cm. The left border of the heart was 10.5 cm., and the right border was 3 cm. The heart rate was regular, 84. There was a systolic murmur heard at the apex. This was not transmitted. The abdomen was soft, and the wall relaxed and thin. There was some weakness in both inguinal rings. Peristalsis was visible. There was no tenderness noted. Rectal examination revealed a prolapse of a small amount of rectal mucosa. The rectum was empty. The left lobe of the prostate was hard and encroached somewhat on the midline. *Extremities*—station was slightly unsteady. The gait was definitely unsteady. He walked with a wide base, and when he walked fast he tended to fall forward. The fingernails were somewhat curved. There was slight tremor of the hands. Biceps and triceps tendon reflexes were present and slightly hyperactive. Babinski was negative on the right and showed no response on the left. The sense of position seemed to be intact. The finger-to-nose test was fairly well performed. Touch sensation seemed to be slightly reduced over the lower extremities.

A neurosurgical consultation was held on May 21, 1939. The following report was made: "Impression: If the very high total protein estimation is disregarded momentarily, the diagnosis appears to be that of cerebral arteriosclerosis with the involvement of both vestibular apparati. The fact that there is no involvement of other cranial nerves adjacent to the eighth and no papilloedema, lateral cerebellar signs, or subjective symptoms rules out an angle tumor. The high total protein estimation may be due to a hemorrhage which was not recognized in the first lumbar puncture. The patient's rapid return to normal, or at least improvement under rest is also against the diagnosis of a tumor. Considering the relatively low blood pressure with arteriosclerosis, the use of benzedrine might be helpful in controlling his subjective signs."

Ophthalmological consultation on May 22, 1939, was reported as follows: "Optic nerves were normal in appearance. Peripheral fundi were normal. Visual fields showed slight and concentric contraction. The contraction was probably due to inattention and no real pathology. The pupils were regular and equal, reacted to light and accommodation. Extra-ocular movements were normal and coordinated. There was no ptosis and no nystagmus at the time of examination. Corneal reflex on the right side was slightly diminished. Fifth nerve was otherwise normal; seventh intact on each side. Eighth nerve: an audiogram showed a marked loss of hearing in each ear, more pronounced on the right. The technician reports that the findings were probably inaccurate, as the reaction time of the patient was quite slow.

"Barany's turning test showed twenty seconds' nystagmus after turning in each

direction. This is a normal reaction of the vestibular apparatus.

"Impression: While a complete neurological examination was not done, and I have no knowledge of the condition of the deep reflexes and pyramidal tract, it is my feeling that there is probably an inadequate blood supply to the thalamic regions. His history of the propulsion gait is more suggestive of the phenomenon seen in paralysis agitans than of any cerebellar neoplasm. The unequal loss of hearing, however, is to be considered, and I suppose the cerebellopontine angle must be excluded."

Laboratory findings: An x-ray of the skull done on May 17, 1939, was reported, "probably negative. There was some air in the ventricular system. The pituitary fossa was normal in size, and there was no evidence of increased intracranial pressure, metastatic malignancy or other bone changes. The skull configuration was suggestive of an oxycephaly."

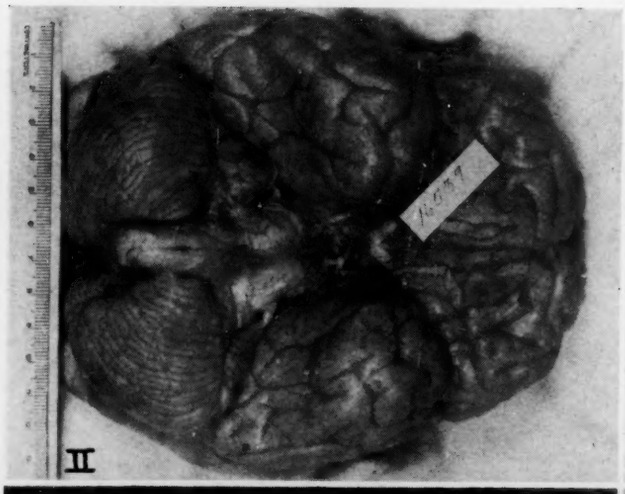
Stereo of the skull on May 25 showed "a rather thin cranial vault without localized changes or signs of increased intracranial pressure. The pineal body was apparently in the midline and not displaced. The petrous and sphenoid ridges were clear and equal. There was rather marked calcification of the internal carotid artery on the left and apparently a small aneurysm lying just beside the sella turcica. Impression—aneurysm of the internal carotid artery."

Film of the pelvis on May 25 showed "no evidence of metastatic malignancy. There was considerable hypertrophic arthritis."

Accessory Clinical Findings: A blood count taken on May 8 showed a hemoglobin of 86 per cent; 4,050,000 red blood cells; 8,600 white blood cells, with a differential of 75 per cent polymorphonuclears; 21 per cent lymphocytes, 2 per cent eosinophils, and 2 per cent monocytes. A urinalysis done on May 9 showed a specific gravity of 1.013, and a neutral reaction. It was negative for albumin and sugar, and showed only occasional leukocytes microscopically. Blood Wassermann and Kahn were negative. Blood chemistry on May 17 showed urea nitrogen, 9 mg., blood urea, 19.2 mg.; and blood sugar, 100 mg. per 100 cc. On the following day, his blood calcium was found to be 11 mg., his blood phosphorus, 4 mg., and his blood bromide to be less than 10 mg. per 100 cc. Spinal fluid examination made on May 19 was reported as follows: Appearance—clear; cells—negative; globulin—marked increase; colloidal gold—11,222,100; Wassermann—QNS; and total protein—513 mg. The total protein content of the spinal fluid five days later was 120 mg. per 100 cc.

The patient was kept in the hospital from May 16 to June 1 and was discharged unimproved. On June 26 he was readmitted in an unconscious state with a very high fever. He never recovered consciousness, and died June 28, 1939. The following is a report of the autopsy findings.

Gross Anatomical Findings: The body is that of a thin, moderately well preserved, elderly white male 70-75 years old. The skin shows much hyperkeratosis over the entire body. There is a large sloughing ulceration over the lumbo-sacral region, which exposes the spinous processes of the vertebrae. The left inguinal ring is larger than the right. *Chest:* There is no free fluid in the pleural cavities and there are scattered, dense, fibrous adhesions. There is an irregular, thickened, white gritty area in the pleura, near the apex of the right lung. Both lungs are moderately heavy, and scattered through them are a number of lumpy, grayish-red areas, 5-12 mm. in diameter. The anterior portions of the lungs are light and feathery. *Heart:* There is no increase of pericardial fluid. The pericardium is smooth and glistening. The heart is normal in size. The valves and endocardium are normal. The aorta shows a few elevated, irregular, yellowish areas on its intima, especially in the abdominal portion. *Abdomen:* There is no free fluid in the peritoneal cavity. The peritoneum is smooth and glistening. All organs are in their normal positions. The liver is normal in shape and size, with a smooth surface. The gall bladder and ducts are normal. The spleen is normal in shape and about half the usual size. The substance is of a reddish-purple color and slightly tough. The pancreas is grossly normal. The gastrointestinal system is grossly normal. *Urinary System:* The kidneys are normal in size. The capsule strips easily, leaving only a very slightly granular surface. The cortex and medulla are sharply demarcated. The pelves have a smooth lining and are surrounded by a moderate amount of fat. The ureters are normal. The bladder contains about 30 cc. of slightly turbid urine. The wall is of the usual thickness and the lining is normal. The prostate is very slightly increased in



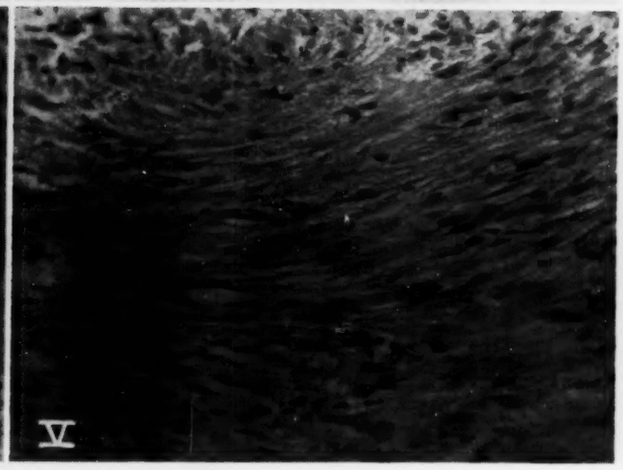


Fig. 2. Brain, showing the cerebellopontine angle tumor, with displacement of the pons.

Fig. 3. Transverse section of the cerebellum and tumor, showing pressure on the cerebellum.

Fig. 4. Slide showing the tumor tissue, magnified 165 times.

Fig. 5. Slide showing the tumor tissue, magnified 355 times.

size, is quite hard and contains two or three stony concretions, 3-4 mm. in diameter.

Skull: The cranial vault has a moderately thin wall, and is otherwise normal. The brain and its meninges show no striking features, except in the right cerebellopontine angle. Here is an ovoid, encapsulated, firm, grayish-white tumor mass, 16 x 20 mm., which is attached to the acoustic nerve on this side. It presses down into the cerebellum and pushes the pons towards the left. On its free margin is a small depression with a slightly red base. Blood vessels around the base of the brain show only an occasional small, yellow plaque on their intimas.

Histological Findings: The tumor from the acoustic nerve is fairly cellular; and along the periphery in one area are numerous blood sinuses, hemorrhages, and a little surface erosion. Its cells have indistinct outlines; the nuclei are elongated and have a tendency to run in bands. In places there is a palisade arrangement, and in other places there are some small whorls of cells.

Lungs: These show congestion and edema and a patchy purulent inflammatory process involving the bronchioles and their surrounding alveoli. *Kidneys:* The arteries show a little thickening of their walls and there is an occasional scattered hyaline glomerulus present. *Spleen:* The arteries and arterioles show thickening of their walls, and there is some calcification in the wall of one of the larger arteries. The pulp is engorged with blood. Liver, adrenals, pancreas, and heart show no striking histological changes.

Pathological Interpretation: Fibroblastoma of the acoustic nerve (cerebellopontine angle tumor). Bronchopneumonia.

Discussion

According to Cushing[2], the historical information concerning acoustic tumors which

2. Cushing, Harvey: Tumors of the Nervus Acusticus, Philadelphia, W. B. Saunders Co., 1917.

Carl Gustav Lincke gathered in 1837 for his valuable and timely treatise on diseases of the ear, has served to introduce nearly all monographs on the subject since. The first clinical account of what seems to be an undoubted tumor of the acusticus appeared in 1830 in the appendix to Charles Bell's classical monograph on the nervous system. By far the most important and complete of these earlier reports was made by Jean Cruveilhier in a chapter on diseases of the dura mater, in the second volume (1835-1843) of his justly celebrated folios, ANATOMIE PATHOLOGIQUE DU CORPS HUMAIN.

Ewing[3] says that intracranial tumors of the nerve trunks affect chiefly the acoustic, rarely the trigeminus nerve, and form a relatively frequent and characteristic group of brain tumors. They are usually single, rarely bilateral, and may form a part of general neurofibromatosis. He says the condition was reported by Foerster in 1862, and fully described by Monakow in 1900.

The tumors occur usually before the fiftieth year, and often in young persons. They may be associated with other abnormalities of the brain, such as hyperplasia and hypertrophy of the glia cells of the cortex, endothelioma and psammoma of the dura, sarcoma of the brain, and multiple hernia of brain tissue through the dura. These abnormalities suggest an underlying anatomical predisposition to tumor growth.

The tumors begin in a portion or involve the whole of the nerve trunk, producing a fusiform or round swelling which has been encountered as small as a cherry, or as large as a hen's egg. They are firm, lobulated, and encapsulated, but often adherent. They compress the cerebellum, medulla, and adjoining nerves. The diffuse swelling of the nerve may penetrate the internal auditory meatus.

The structure is usually that of simple neurofibroma, but some very cellular growths approach the type of neurosarcoma. Glia tissue has several times been demonstrated, and from this element a sarcomatous process may be derived. Regressive changes include fibrosis and cyst formation.

The trigeminus, acoustic, facial, glossopharyngeal, and vagus nerves arise from the neural ridge, which appears at an early date when the tissues are comparatively undifferentiated, while the other cranial nerves develop from the cerebral vesicles. Hence, the former nerves may readily include embryonal cell groups which explain the complex structure of their tumors.

The clinical course is that of a slowly growing tumor of the posterior fossa, preceded by symptoms referable to the fifth or eighth nerve. The slow course and encapsulation place them among the operable cases, but the inaccessibility, adhesions, destruction of neighboring vital tissues, and occasional malignancy yield an unfavorable prognosis.

Cushing[4] refers to his monograph[2] on acoustic tumors, in which he adopted the simple term, "acoustic tumor", as being anatomically more precise than cerebellopontine tumor; for in the cerebellopontine recess other tumors than those arising from the acoustic nerve are not infrequent. This term was preferable to such histological misnomers as endothelioma, sarcoma, fibroma, glio-fibroma, etc., which had been given to acoustic tumors. The designation "acoustic neurinoma" of Verocay was misleading, as the tumors probably contain no neuroglial elements; and it was scarcely necessary, as all of them have an identical structure. The more modern designation—perineural fibroblastoma of the acoustic nerve—introduced by Mallory—is histologically correct, but is unnecessarily cumbersome for everyday parlance.

Wechsler[5] quotes Cushing as saying that these tumors take origin from the sheath of the eighth nerve at the internal auditory meatus.

Cushing[4] further states that, if there is an accurate and dependable chronology of symptoms, these tumors are probably the most easily diagnosed of all intracranial neoplasms. Only when the anamnesis is faulty or undependable are they likely to be mistaken for other tumors of the cerebellopontine recess.

The tumors, moreover, so far as is known, originate in that portion of the nerve which lies within the porus acusticus, and since they have an obvious relation to von Recklinghausen's disease, in which multiple lesions of essentially the same histological nature occur, they are doubtless of similar congenital origin.

So far as our clinical experience goes, patients with large acoustic tumors may still

3. Ewing, James: Neoplastic Diseases, 1931, ed. 3, p. 471-473.

4. Cushing, Harvey: Intracranial Tumors, Springfield, Ill., C. C. Thomas Co., 1932, p. 85-92.

5. Wechsler, Israel S.: Textbook of Clinical Neurology, Philadelphia, W. B. Saunders Co., ed. 3, p. 502.

retain some hearing, but the vestibular responses to caloric tests are invariably abolished, and are never regained after operation.

Symptoms: These patients as a usual thing first show tinnitus, accompanied or followed by gradually increasing deafness on the affected side[6]. These two symptoms may be succeeded immediately by the other signs, or these may be delayed so long that the patient does not associate them with his earlier symptoms. After a longer or shorter period, then, there occurs evidence of pressure upon other cranial nerves in the neighborhood—most often the fifth, as suggested by a feeling of numbness in the face; or the seventh, as shown by weakness, or more rarely, twitching of the facial muscles. As the growth extends downward towards the medulla, the ninth, tenth, and eleventh nerves may be irritated or paralyzed, with consequent impairment of speech or of swallowing. Subsequent to the involvement of these various cranial nerves, the tumor begins to press inward against the pons, narrowing the aqueduct, and directly compressing the cerebellum. From this, two new sets of symptoms result: first, general pressure symptoms due to internal hydrocephalus; and second, evidence of cerebellar incoordination in the form of unsteadiness in gait or even actual staggering. Examination reveals paralysis of the vestibular portion of the eighth nerve (lack of response to instillation of cold water into the external ear), cranial nerve palsies, nystagmus, ataxia, and other cerebellar features. Choked disc is of course to be expected.

While mental symptoms occasionally occur, they are not common; headaches with suborbital discomfort should be listed among the symptoms. Nausea and vomiting, and finally cerebellar crises and respiratory difficulties are present in the terminal phases.

Comment: One explanation for the exceptionally high protein in this case may be found in the pathological report. As will be noted, the tumor had possibly been seeping from the eroded area. The colloidal gold was in keeping with that found in 32 per cent of Merritt's cases. It was a lilac or a number "2".

Our failure to diagnose this case during life was naturally a source of embarrassment to us. We are making no attempt to "alibi" ourselves out of this situation. We simply hope that our mistake may help some of our colleagues, and keep them from making the same type of error.

The differential diagnosis between cerebral senile sclerosis and brain tumor was the chief difficulty presented by this case. The mental deterioration, the neurological symptoms, even the tinnitus, seemed explainable on a senile basis. The age of the patient was in favor of a circulatory etiology. This man's mental deterioration also interfered with his outlining a proper chronological array of symptoms. Normal eye-ground findings, too, were misleading; and, as will be noted, the x-ray diagnosis of marked calcification of the internal carotid artery on the left, and the suggestion of a small aneurysm, was not borne out in the pathological findings.

Conclusion

First, we have presented the case of a man of 71 who was well within the arteriosclerotic age, and who showed a tumor which usually appears before the age of 50. Second, while the arteriosclerotic element offered definite difficulty in making a differential diagnosis, it appears from the pathological report that this man had surprisingly little arteriosclerosis of his cerebral arteries. Third, in retrospect, it would seem that there are several things that should have made us consider brain tumor more seriously. These are: first, the unequal loss of hearing; second, the inconclusive Babinski on the left; third, the unusually high protein content of the spinal fluid; and fourth, the reduction in the corneal reflex on the right. Another error we made was in not having an x-ray of the porus acusticus internus done. This is often of great diagnostic aid.

6. Homans, John: Textbook of Surgery, Springfield, Ill., C. C. Thomas Co., 1931, p. 554-555.

The Physician's Knowledge of Human Nature.—The physician's knowledge of human nature must be profound in order to permit him to place the person in the various categories of the human species. He must recognize the intellectual, critical individual; the emotional, erratic type; the stolid, reluctant personality; the mentally inadequate as well as the ignorant. These are but a sampling of the various human problems that confront the physician in his daily life. He must be prepared to meet these innumerable problems with correspondingly innumerable variations in method.—F. A. Willius, M.D.: A Talk on the Science and the Art of Medical Practice, Proc. Staff Meet. Mayo Clinic, 15:649 (October 9) 1940.

THE ANTISTREPTOCOCCIC ACTION OF LOCAL APPLICATIONS OF ALCOHOL-ACETONE AQUEOUS MERCURO-CHROME IN ACUTE TONSILLITIS AND PHARYNGITIS

MARY A. POSTON, M. A.
and
WILLIAM D. FARMER, M. D.

Among the many preparations used for the local treatment of acute tonsillitis and pharyngitis are silver nitrate, gentian violet, methylene blue, metaphen, merthiolate, argyrol, hexylresorcinol, aqueous mercurochrome and alcohol-acetone aqueous mercurochrome (Scott's solution).* Because of our impression that the best clinical results followed the use of 2 per cent alcohol-acetone aqueous mercurochrome, it seemed important to study the effects of local applications of this drug on the numbers of hemolytic streptococci found in the throats of patients. The results of this investigation are reported in this paper.

Materials and Methods

The patients were University students or members of the staff of the Hospital, who had been referred to us because of acute tonsillitis or pharyngitis. None had received previous medication. All cultures were taken by one of us in order to obtain more uniform results. Material for culture was obtained by rubbing a sterile rolled cotton applicator over the mucous membranes of the throat. The throat then was painted with Scott's solution. Half of the patients were asked to return in four hours, the other half in twenty-four hours for a second culture and another treatment.

The swabs were placed immediately into a test tube containing 10 cc. of plain beef infusion broth, pH 7.4. As much material as possible was washed from the swabs by rolling them against the inside wall of the test tube. One cc. of this broth was transferred to another test tube containing 10 cc. of beef infusion broth (tube 2). After thorough mixing 1 cc. of the broth in tube 2 was transferred to a third tube of broth (tube 3). Two plates were poured, using molten plain beef infusion agar to which 2 cc. of sterile blood had been added, with 1/10 cc. of the mixture in tube 2 for one plate and 1/10 cc. of tube 3 mixture for the other plate.

Results

Fifty-nine patients with acute tonsillitis and pharyngitis were treated with 2 per cent alcohol-acetone aqueous mercurochrome. Cultures of the throats before treatment showed hemolytic streptococci in only 26 instances. Twenty of the patients with cultures positive for streptococcus hemolyticus returned for a second culture either four or twenty-four hours after treatment. In 18 patients the second culture showed a decrease in the number of hemolytic streptococci (Table I).

TABLE I

Number of Colonies of Streptococcus Hemolyticus in Throat Cultures of Patients Before and After Treatment

Patient	*Before Treatment*	*4 Hours After Treatment*	*24 Hours After Treatment*
R. P.	Innumerable	14	—
R. C.	Innumerable	73	—
W. S.	Innumerable	104	—
A. M.	Innumerable	50	—
J. W.	100	3	—
D. R.	100	0	—
M. J.	100	—	17
A. W.	80	—	39
A. S.	79	—	7
H. C.	43	—	0
R. P.	15	0	—
J. R.	15	—	2
J. S.	11	3	—
R. R.	4	—	0
P. T.	4	—	0
D. Y.	4	—	2
H. C.	4	—	6
H. G.	2	—	1

The number of streptococcus colonies was unchanged in one patient, and in another patient the number was increased.

The number of cultures positive for streptococcus hemolyticus was much lower than was suspected clinically. It was not possible to determine the etiologic organism from the appearance of the throat alone.

Summary

1. Eighteen of 26 patients with a hemolytic streptococcus infection of the throat showed a decrease in the number of streptococcus hemolyticus colonies after local application of 2 per cent alcohol-acetone aqueous mercurochrome (Scott's solution).

2. These findings are in agreement with the clinical observation that this solution is effective in relieving symptoms accompanying acute tonsillitis and pharyngitis.

From the Department of Bacteriology and the Department of Otolaryngology of the Duke University School of Medicine and Duke Hospital, Durham.

* Mercurochrome 2 Gm., alcohol 55 cc., acetone 10 cc., distilled water 35 cc.

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JANUARY, 1941

TAKING INVENTORY

Since, with this issue, the NORTH CAROLINA MEDICAL JOURNAL enters upon its second year at the customary season for inventory taking, the time seems opportune for a heart-to-heart talk with our readers.

The Editorial Board, with the hearty cooperation of the unofficial Associate Editors, has tried to make the journal worthy of the best traditions of North Carolina and the North Carolina medical profession. We have tried, first of all, to have the NORTH CAROLINA MEDICAL JOURNAL neat and dignified in its appearance. For this we are to thank the Penry-Aitchison Printing Company, particularly Mr. Harry Aitchison and Mr. L. B. Womble, who have assumed the responsibility for its make-up. They have borne with the utmost courtesy and patience the inexperience of the editor and the assistant editor.

Of equal importance is the quality of the contents. We are fortunate in the ability of the profession of North Carolina, which has assured us an abundance of original articles from which to choose; and we have been fortunate, also, in the high quality of papers and addresses from visitors to the state. It has been impossible, of course, to publish all the papers that have come to us, and a number have been regretfully returned to their authors. Every paper submitted, however, has had the sympathetic consideration of at least two competent readers. If these did not agree, a third was asked to cast the deciding vote.

Doubtless many contributors, especially those who read papers at the annual meeting in May, have wondered why publication of their papers has been so long delayed. In selecting papers for each issue, there are a number of factors to consider. First is the question of timeliness. To a certain extent, this enters into the publication of all papers, but in some it is much more important than in others. Another consideration is the proper balance of material in each issue. A very important factor is that the number of pages in each issue must be a multiple of four. Some papers have been carried over as long as three months, for the same reason that Charles Dickens' character, Mr. Venus, gave for failing to incorporate Silas Wegg's amputated leg into a skeleton he was assembling: "I can't work you into a miscellaneous collection, nohow; do what I will, you can't be got to fit."

When any doctor gives a special reason for the early publication of a paper—for example, if he is seeking certification by one of the various boards, has been proposed for membership in such an organization as the College of Surgeons or Physicians, or if he desires priority in some original research—we are glad to publish his article as soon as possible.

Most of the Clinico-Pathological Conferences that we have been carrying every month have been furnished during the past year by Duke Hospital, the City Memorial Hospital of Winston-Salem, and the North Carolina Baptist Hospital. There are other good hospitals in the state that should have such reports for publication. These would be gladly received.

We realize that there have not been enough news notes of general interest, and too few reports of county society meetings. However, we cannot publish news notes without news, and must depend upon the secretaries of the various county and district societies, and of the other medical organizations, for programs, resolutions, and items of general interest about their members. We draw heavily upon the two month-

ly county Bulletins, and are always glad to have programs of other meetings.

It is important that manuscripts submitted be double spaced, with liberal margins. Single spaced articles are hard to read, and leave no room for corrections. In the future all manuscripts that are not double spaced will be returned to the authors for retyping.

The publication of our journal is made possible by our advertisers; and it carries only high grade advertising by high grade advertisers. You will help our journal by patronizing these firms, and by letting them know that you read their advertisements in the NORTH CAROLINA MEDICAL JOURNAL.

Finally, let every member of the North Carolina Medical Society read on page iv, above the Table of Contents, that the NORTH CAROLINA MEDICAL JOURNAL is "the official organ of the Medical Society of the State of North Carolina"; and on the first page of reading matter, and again on the editorial page, that it is "owned and published by the Medical Society of the State of North Carolina." The NORTH CAROLINA MEDICAL JOURNAL belongs to you; help make it a publication you can be proud of.

* * * *

DR. EDGAR A. HINES

On November 27, Dr. Edgar Alphonso Hines, Sr., of Seneca, South Carolina, died of coronary occlusion. His passing is a great loss to the medical profession of South Carolina and of the nation. Except for a two-year interim, he represented our sister state in the House of Delegates of the American Medical Association for thirty years. He had been secretary of the South Carolina Medical Association and editor of its Journal so long that his name virtually symbolized organized medicine in South Carolina.

To the very last, Dr. Hines was a busy man. Among the many medical organizations to which he belonged were the American Academy of Pediatrics and the American College of Physicians. He was chairman of the Committee on Medical Preparedness for South Carolina.

Dr. Hines possessed the spirit of eternal youth, that kept him always abreast of his profession. His son, Edgar A. Hines, Jr., is now connected with the Mayo Foundation as Associate and Consultant in Medicine, and is Assistant Professor of Medicine at the University of Minnesota. The names of father and son appear together as Fellows in the Directory of the American College of Physicians. To the son, the NORTH CAROLINA MEDICAL JOURNAL extends sincere sympathy. It is good to know that his shoulders are so capable of bearing the mantle that has fallen from his father.

* * * *

DR. FRED HANES HONORED

Last month a signal honor came to Dr. Frederic M. Hanes, Professor of Medicine at Duke University. According to the *New York Times* for December 20, "The Phi Beta Kappa Associates, an organization founded last February to cooperate with the Phi Beta Kappa Fraternity in the development of a high caliber of American leadership, elected eighty founder members from all parts of the United States at the first annual meeting" held in New York on December 19. Dr. Hanes was one of these founder members. The *Times* stated that "with the diploma signifiying membership in the organization, each of the eighty leaders in the civic and professional life of the nation received a citation commending him for high intellectual achievements and distinguished public service."

Dr. Hanes's citation read as follows:

> "Frederic M. Hanes: Educator and physician, a tireless worker in the fields of pathology and neurology, he is now professor of medicine at Duke University. Shortly after receiving his medical degree at Johns Hopkins University he became pathologist at the Presbyterian Hospital in New York city, and associate professor of pathology at Columbia University.
>
> "At the outbreak of the World War he was assistant in neurology at Queens Square Hospital in London, and, on United States entry into war he became lieutenant-colonel in the army medical corps, in command of a base hospital. A fellow in the American College of Physicians, member of the American Association of Physicians and the Clinical and Climatological Association, he comes to Phi Beta Kappa Associates as a founding member."

It was no surprise that Dr. Hanes was selected for his "high intellectual achievements and distinguished public service"; but the doctors of North Carolina are justly proud of the additional honor that has come to this distinguished member of a distinguished family.

DO THE PEOPLE WANT PREPAID MEDICAL SERVICE?

In much of the propaganda directed against organized medicine the suggestion is made over and over that the people in the low income groups are most anxious to insure themselves against sickness. The impression is left, either by direct assertion or by innuendo, that the medical profession blocks every such plan proposed. Indeed, the suit against the A. M. A. is based upon the charge that this organization has persistently fought an attempt upon the part of government employees in Washington to provide prepaid medical service for themselves.

An interesting commentary is the experience of the District of Columbia medical profession in its effort to meet this supposed demand by establishing its own prepayment medical service plan. Approximately six hundred physicians agreed to support the program, known as Mutual Health Service, "in the sincere hope that under this plan medical care could be made more readily available to the low-income group." The story of the undertaking is told in the April number of the *Medical Annals of the District of Columbia.* After carefully studying approved methods for such a service, a whole-time administrator was employed. Every effort was made to secure the approval and cooperation of various Government agencies, but the only one that showed any spirit of helpfulness—or, indeed, the slightest interest—was the Department of Agriculture. Of the 26,219 employees of government agencies or business institutions finally circularized, only 2,219 replies were received. Of those replying, 265 were eligible and interested; 940 were eligible but not interested; 536 were not eligible but interested; 473 were not eligible and not interested; 5 were undecided. On April 3, 1940, the Medical Society of the District of Columbia was obliged to abandon the undertaking.

When it is seen that, with a single exception, all Government agencies in Washington are indifferent to prepaid medical care for the low income group, and that, of the people given an opportunity to obtain such sickness insurance, only a trifle more than one per cent of those eligible were interested, one must agree with the conclusion reached by the editor of *Medical Annals* "that the demand for prepaid medicine has been exaggerated. It is quite apparent that a majority of people are not ready nor do they want change in the present method of providing medical care."

* * * *

A NEW SULFA DRUG

Science for December 20, 1940 (page 9 of the Supplement), tells of a new member of the sulfonamide group called sulfanilylguanidine, which promises to be very useful in treating infections of the intestinal tract. It is fairly soluble in water, but very poorly absorbed from the digestive tract, and most of it reaches the colon. After Dr. E. K. Marshall, of Johns Hopkins, first tried it on animals, Dr. Warfield M. Firor, acting chief surgeon at the Johns Hopkins Hospital, used it to rid the alimentary canal of germs preliminary to operations that necessitate opening the bowel. "In every case so far the wounds have healed without infection", and there have been no deaths thus far in the series. "In one case the bacterial count dropped from 17,000,000 to 10,000."

The drug is being tried in bacillary dysentery. While the preliminary reports are encouraging, Dr. Marshall says that the number of cases treated thus far is too small for proper evaluation. One great advantage of sulfanilylguanidine is that it is the least toxic of the sulfa group. It has not yet been released for sale, but is going through a probationary period, just as did sulfapyridine and sulfathiazole. Let us hope that this new remedy may be the weapon needed to conquer that weird and baffling malady, ulcerative colitis, as well as various other intestinal infections.

* * * *

DR. CHARLES O. DeLANEY

Dr. Charles O. DeLaney, of Winston-Salem, died of coronary heart disease just after midnight on December 15. He was in the very prime of a busy and useful life. His good judgment, manual dexterity, and devotion to his chosen field, urology, made him highly respected by his patients and his colleagues. His intimates knew him as a warm-hearted, generous friend, who "bore without abuse the grand old name of gentleman." On behalf of the medical profession of the state, the NORTH CAROLINA MEDICAL JOURNAL extends deepest sympathy to his wife and children.

CASE REPORTS

CLINICO-PATHOLOGICAL CONFERENCE

CITY MEMORIAL HOSPITAL

WINSTON-SALEM

Presentation of Case

A male negro, 50 years of age, was admitted to the hospital complaining of pain in his side.

The onset of the illness was somewhat indefinite. The patient stated that he had had pain in his right side for the previous three to four weeks, and thought that he had "strained himself." The pain improved somewhat, but two days before admission it became very severe, and he went to bed and called a private physician. This physician found marked tenderness over the right sacro-iliac joint and pain on motion of the right thigh. The patient was hardly able to turn over in bed. His temperature, pulse and respiration were normal and his abdomen was flat and soft. There was no tenderness in the kidney region. The physician strapped his back, and this considerably relieved the pain. Two days later the physician was called again and found the patient in extreme pain, with the tenderness over the sacro-iliac region described above, and, in addition, tenderness over the right kidney and a definite tender mass palpable deep in the right side of the abdomen. There was some rigidity of the abdomen. The patient was referred to the hospital.

The family history and past history were non-contributory.

Physical examination revealed a lethargic, rather un-cooperative individual. There was a definite arcus senilis present. The pupils reacted to light and accommodation. The lungs were clear. The heart showed a moderate degree of hypertrophy of the left ventricle, and a sinus arrhythmia was present. The abdomen was asymmetrical; the right side was more prominent than the left and was rigid. Both the distention and the rigidity extended into the flank, downward almost to the inguinal ligament, and upward to within 10 cm. of the costal margin. A mass about 5 cm. in diameter was palpable in this region, and was palpable equally as well in the flank as from the anterior surface. The lateral and posterior portions of this mass appeared to be larger than the anterior portions. The mass was very tender and dull to percussion. There were numerous large varicosities of the right leg, some measuring as much as 2 cm. in diameter; and the circumference of the right leg was 5 cm. greater than the circumference of the left leg. The blood pressure was 160 systolic, 90 diastolic; the pulse, 90, the temperature, 98.2 F., and the respirations 24.

Examination of the urine on admission showed a cloudy, straw-colored, acid urine with 16-19 white cells per high power field and occasional red blood cells. No albumin or sugar was present. There were 2,750,000 red cells, 7 grams of hemoglobin, and 8,150 white cells with 82 per cent polys and 18 per cent lymphocytes. The Kline test was negative. On the day after admission the urological consultant described the mass as fluctuating and in the region of the right kidney. There was considerable rigidity of the lumbar and abdominal muscles. A flat plate of the abdomen "shows an opaque shadow about the size of a BB shot on the right side at the level of the transverse process of the third lumbar vertebra. It is in the region of the lower pole of the kidney, and may be a stone in the kidney, as it appears too far out to be a stone in the ureter. The kidney outline is not defined. The right diaphragm is considerably elevated and the right psoas outline is obliterated by a soft tissue mass." The cystoscopic examination revealed nothing abnormal in the bladder except moderate congestion. A number 6 French catheter passed easily to the pelvis of the left kidney. A number 7 French catheter passed about two-thirds the way up the right ureter and then stopped. Indigo carmine appeared from the left kidney in six minutes, and from the right kidney had not appeared at the end of thirty minutes. The next day a pyelogram showed that "the catheter in the right ureter is displaced toward the midline by a soft tissue mass filling the right side of the abdomen. The right kidney is displaced upward and medially over the twelfth dorsal and first lumbar vertebrae." Urine collected from the right kidney pelvis showed the microscopic field to be entirely covered with pus cells. The culture of this urine was negative. A nonprotein nitrogen done the day after the pyelogram was 42 mg. per 100 cc. and the creatinine was 3 mg. per 100 cc. The patient rested fairly comfortably, yet any attempt at move-

ment caused great pain. He was lethargic during his entire stay in the hospital. His temperature was normal or slightly below normal, except for one rise to 99.8 F.; his pulse varied between 90 and 100; and his respirations varied from 20 to 24. The patient died rather unexpectedly during the night of the fourth hospital day.

Differential Diagnosis

Dr. Howard M. Starling

The most outstanding symptoms presented by this patient, it seems to me, are:

1. Pain in the right side of three or four weeks' duration.
2. Pain over the right sacro-iliac joint.
3. Pain on motion of the right thigh.

The most outstanding physical signs appear to be:

1. Mass in the right side of the abdomen, extending into the flank, with tenderness and muscular rigidity.
2. Description of the mass by the urological consultant as fluctuant.
3. Secondary anemia (hemoglobin, 7 Cm., red blood cells 2,750,000).
4. Varicosities and increase in size of the right leg.

Other findings to be kept in mind are:

1. Tenderness over the right sacro-iliac and kidney regions.
2. Pyuria, which was found to be from the right kidney.
3. Obstruction to the catheter in the right ureter.
4. Absence of dye from the right kidney.
5. X-ray evidence of obliteration of the outline of the psoas muscle, elevation of the right side of the diaphragm, and displacement of the right kidney and ureter medially by the mass.

There are several possible conditions to be considered in the differential diagnosis:

1. Perinephritic abscess.
2. Psoas abscess.
3. Appendiceal abscess.
4. Hyperplastic tuberculosis of the cecum.
5. Carcinoma of the cecum.
6. Dissecting aneurysm of the aorta.

A perinephritic abscess, or perirenal abscess, may be primary or secondary. The primary form is hematogenous in origin and is carried from some distant focus, while the secondary form is a result of pus getting into the perirenal tissue from some neighboring organ. This organ may be the kidney, or it may be the appendix, gall bladder or pelvic organs. The pus may pass upward and form a subphrenic abscess, or down into the pelvis. The findings here that might be in keeping with a perinephritic abscess are: pyuria from the right kidney, pain on motion of the right leg, and x-ray findings that are quite in keeping with those of a perirenal abscess. Against this diagnosis, though, I would call attention to the relatively small amount of tenderness directly over the kidney posteriorly, with the apparent absence of muscle spasm posteriorly. The presence of varicosities and edema of the right leg and the absence of pyrexia and leukocytosis could hardly be explained by this condition, and I am of the opinion that this man did not have a perinephritic abscess.

Appendiceal abscess is a possibility. No other organ produces so many bizarre symptoms and signs in the lower abdomen as does the appendix. The tender mass with muscle spasm and pain on movement of the right leg could certainly be caused by an appendiceal abscess; the ureteral obstruction could be produced by pressure on the ureter; and I think we could conceivably have a normal temperature and a normal total white count. However, there is a total absence of any history suggestive of acute appendicitis, and appendiceal abscess therefore appears improbable.

Pott's disease of the spine may be caused by any one of the "Big Four" diseases—namely, inflammation, syphilis, tumors and tuberculosis. Tuberculosis is by far the most frequent offender. The dorsolumbar region is most frequently involved. In the adult it begins as a periostitis. Several vertebrae may be involved, and while there is not an extensive process in the vertebrae, nevertheless, there is a very definite one. Pus formed at the seat of the disease displays a remarkable tendency to travel. The pus may enter the sheath of the psoas, which is attached internally to the bodies of the vertebrae. It may come to the surface in the lumbar region, extend into the iliac fossa, or pass behind Poupart's ligament and point in the groin. The mass found here could be from a psoas abscess. The ureteral obstruction and consequent pyuria could be caused by a local pressure effect, but here again the absence of pyrexia and leukocytosis, and the negative x-ray findings in the bodies of the vertebrae pretty well exclude this diagnosis.

Hyperplastic tuberculosis begins in the ileocecal region. There is a great formation

of tuberculous granulation tissue. Ulceration may develop, but it is not a marked feature of the disease. A tumor-like mass may be formed, which may bear a strong resemblance to a carcinoma even after the abdomen has been opened. The neighboring lymphatic glands are usually enlarged. Hyperplastic tuberculosis is usually associated with anemia such as we have here. Pain is an inconstant and unreliable factor, as it is in malignancy. Temperature may or may not be present. The leukocyte count is usually not sufficiently increased to be of much assistance. The age of the patient makes a hyperplastic tuberculosis improbable, for it occurs in young adults and is rare in patients over the age of 40.

In carcinoma of the cecum and right half of the colon the most common findings are: (1) tumor mass and (2) secondary anemia. Tumefaction occurs relatively early in this segment of the bowel, and its accidental discovery occasionally calls attention to the presence of a cancer before other symptoms manifest themselves. Anemia almost always accompanies growths in this region, and it is one of the earliest symptoms of right colonic cancer. Rankin says that all cases of unexplained secondary anemia should lead to an investigation to disprove the presence of a right-sided growth. Loss of weight and cachexia are unimportant symptoms of right colonic malignancy, and are rarely present before the diagnosis is apparent. Attacks of abdominal symptoms varying from "indigestion and dyspepsia" to symptoms of subacute or even acute appendicitis are usually present, but these symptoms may be entirely absent. Growths in this area have a tendency to form abscesses and to perforate. Here we have a patient 50 years old, in the cancer age, with a mass in the right side of his abdomen and a secondary anemia, the two earliest symptoms of carcinoma of the right colon. Local extension of the growth with resulting pressure on the right ureter can account for the signs of obstruction of the right ureter. Secondary infection resulting from ulceration may explain the tenderness and muscle spasm present. The findings that would not be in favor of this diagnosis are several. First, it would seem quite unlikely that a local invasion and extension of the growth around the iliac veins would cause enough obstruction to account for the varicosities and edema of the right leg. There appears to be an unusual amount of pain in the sacro-iliac and kidney regions, with a relatively small amount of pain anteriorly, to be accounted for by a carcinoma of the colon. A secondary infection present resulting from ulceration might account for his pain and tenderness, but is unlikely with no temperature and no leukocytosis. It is also difficult to explain the patient's sudden exodus as a result of carcinoma. However, it is possible that we might be dealing here with a carcinoma, with the sudden death being caused from an embolus.

Dissecting aneurysm of the aorta is one in which the blood has made its way through a necrotic area of the media into the middle coat and has then proceeded up or down the vessels, splitting the middle coat in its passage. It is not a real aneurysm but rather a hematoma of the arterial wall. The cause of this condition is not known. We do know, however, that it is not syphilitic in origin. Pain is the most common subjective manifestation, and the pain from a dissecting aneurysm arising in the abdominal aorta is usually located in the back. Extension of the aneurysm may cause agonizing pain. Constant dull boring pain may be the first and most common subjective manifestation of dissecting aneurysm of the abdominal aorta. The ureteral obstruction with a consequent hydronephrosis may be secondary to pressure on the ureter. An edema of the lower extremities may be caused by pressure on the inferior vena cava. Here we have a palpable mass in the lower right abdomen which was described as being fluctuant. The mass extends into the right flank. The pain could certainly be explained by a dissecting aneurysm of the aorta. The obstruction to the right ureter and infection of the right kidney could be caused by pressure on the ureter, and the varicosities and swelling of the right leg could result from obstruction to the return venous flow through the right iliac vein. The mass posteriorly could explain the x-ray findings of obliteration of the outline of the psoas muscle and displacement of the right ureter and kidney medially; and lastly, a rupture of the aneurysm through the external coat of the aorta, with consequent fatal hemorrhage, could explain the patient's sudden death. It seems most likely to me that this patient's death should be attributed to a ruptured dissecting aneurysm of the abdominal aorta.

Clinical Diagnosis

Retroperitoneal sarcoma.

Dr. Starling's Diagnosis

Ruptured dissecting aneurysm of abdominal aorta.

Pathological Diagnosis

Dissecting aneurysm of aorta with rupture.
Retroperitoneal hematoma on the right.
Pleural effusion, right.
Hydronephrosis, left.
Cardiac hypertrophy.
Benign enlargement of prostate.

Pathological Discussion

Dr. T. T. Frost

The mass described clinically was found to be a retroperitoneal hematoma containing over 2,000 cc. of partially clotted blood. This hematoma extended from the pelvic brim to the level of the diaphragm, and completely surrounded the right kidney and adrenal. The ureter lay anterior to the mass and was displaced anteriorly and medially. There was a dissecting aneurysm of the aorta which extended from a point just distal to the orifice of the innominate artery throughout the entire length of the thoracic and abdominal aorta, 4 cm. along the left common iliac artery, and 4 cm. along the right iliac artery. At this point in the aneurysm there was an oval perforation with rounded, thickened edges from which a grayish laminated blood clot projected. This oval opening communicated with the retroperitoneal hematoma. The dissection had occurred, as is usual in this type of aneurysm, in the middle of the medial coat of the aorta. The original lumen of the aorta was compressed, and the blood flow had been through the channel of the aneurysm. The edema and varicosities of the right leg were caused by pressure on the right iliac vein by that portion of the aneurysm that extended along the right iliac artery. The upper opening of the aneurysm measured 2 x 3 cm. in diameter, and the edges of this aneurysm were perfectly smooth, slightly rolled and covered by endothelium. The aneurysm was lined throughout by a well developed layer of endothelial cells. Beneath this lining, irregular striations representing the structure of the media could be seen. The superior mesenteric and left renal arteries originated from the lumen of the aneurysm. The rest of the abdominal vessels received their blood from the original lumen of the aorta.

Other findings of minor importance were: sufficient fluid in the right pleural cavity to cause complete atelectasis of the lower lobe of the right lung; a moderate hydronephrosis of the left kidney and a considerable degree of benign enlargement of the prostate.

Dissecting aneurysms of the aorta are not rare, and are based on an idiopathic necrosis of the media. There is no known connection with syphilis. The findings in this case were unusual in that the aneurysm had been present long enough to be lined by endothelium. In the usual case death results so quickly that the endothelium does not have time to grow out and line the lumen of the aneurysm.

BULLETIN BOARD

PRESIDENT'S MESSAGE

MEDICAL LEGISLATION

The 1941 session of the North Carolina Legislature will soon convene. A new governor of North Carolina, J. M. Broughton of Raleigh, will be inaugurated.

North Carolina has never had a governor with higher intellectual attainments, with more scrupulous ideals for our profession, or with a more intimate knowledge of the complex problems which so often present themselves to us. His interest in medical problems is a sympathetic one and is of long standing. Members of his family have been physicians. For many years he has been a trustee of Wake Forest College. The Medical School of that institution and its present expansion and increased usefulness is of vital interest to him. All medical legislation of a major nature must have the endorsement of the administration leaders, of whom the Governor is the chief.

The Medical Society of the State of North Carolina has a Legislative Committee, of which Dr. Donnell Cobb of Goldsboro is chairman. Dr. T. W. M. Long, the Secretary-Treasurer of the Society, will again represent his district as a Senator. In view of the confidence of his fellow legislators, his experience, his intimate knowledge of legislative procedure, and his generous desire to help again as he has in the past, it would be difficult to place a high enough estimate on the aid which he will be able to render on all medical legislation offered through your legislative committee.

While not directly a Medical Society bill, a bill to attach a charge to every automobile license plate sold in North Carolina in order

that hospital bills of all people injured on the highways may be taken care of, will in all probability be again presented to the Legislature. The Wayne County Medical Society has already given its endorsement to a bill of this nature.

It is desirable to have a full time health department in every county in North Carolina. Legislation could accomplish this, and counties which have county health programs could be protected from communities which are not expending money to protect themselves or others against disease.

It is thought that it will be well to grant reciprocity to neighboring states which have the same health certificate requirements for marriage as North Carolina.

The usefulness of our State Board of Health could be increased greatly by an increased appropriation from the State. Much the larger part of its funds come from the Federal Government, and the expenditure is necessarily under a certain amount of Federal supervision.

Our mental institutions are under-manned and over-crowded, and an increasingly heavy burden is being placed on the physicians and personnel in these institutions. North Carolina stands well down toward the bottom of the list of states, between the forty-fifth and forty-eighth, in per capita expenditure yearly for mental cases. More generous help from the State would mean more cures and less institutional burden.

Mental Hygiene is apparently in its infancy in North Carolina. Two full time psychiatrists are employed by the Welfare Department of the State. They serve a population of 3,500,000 people. It is obvious that the funds given to this very essential public health service are inadequate. Most of the patients admitted to our State Hospitals for the insane have been ill for several months before admission. An early diagnosis and early treatment in mental diseases increase the prospect of cure. An adequate Mental Hygiene program would prevent many institutional cases. Enough funds should be allocated for a program similar to the very successful tuberculosis program carried out in this state and elsewhere, to reach every section of the state in an effort to help prevent mental diseases.

Our splendid tubercular institutions and their successful, ever increasing sphere of preventive and curative work, deserve our endorsement and support.

Other legislation will come before the legislature which will arouse your interest, and should command your attention and action. Your Legislative Committee is your voice and your acting body. You may count on it to carry out your expressed will as far as it is able. It deserves your support, both at home with your individual legislators, and in the Legislative Chambers in Raleigh.

HUBERT B. HAYWOOD, *President*
Medical Society of the State of
North Carolina.

NEWS NOTES FROM THE UNIVERSITY OF NORTH CAROLINA

Dr. G. F. Otto, Professor of Parasitology at Johns Hopkins University, spent the week of December 1 in Chapel Hill, cooperating with Dr. H. W. Brown and Dr. J. C. Andrews in hookworm and malaria research.

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Dr. H. W. Brown of the School of Public Health Faculty recently addressed the Wayne County Medical Society on "The Diagnosis and Treatment of Parasitic Diseases".

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Professor H. B. Gotaas of the School of Public Health Faculty gave a paper in New York recently before the Textile Section of the American Society of Mechanical Engineers on "The Treatment of Textile Wastes", embodying the material from the textile waste research program which has been carried on cooperatively between The Textile Foundation and the School of Public Health.

* * *

Miss Ruth Warwick Hay has been appointed Professor of Public Health Nursing on the faculty of the School of Public Health of the University of North Carolina. Miss Hay has been Assistant Professor of Public Health Nursing in the Department of Hygiene of the University of California, at Berkeley, for the past four years. Miss Hay will come to Chapel Hill in the late spring or early summer of 1941, and courses for graduate nurses who wish to specialize in Public Health Nursing will be offered for the first time at Chapel Hill beginning in the fall of 1941.

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Dr. Herbert Fox, Dr. I. H. Manning, Jr. and Dr. Frances Hill Fox have been appointed Instructors in Medicine to assist with the teaching in Physical Diagnosis at the Watts Hospital, Durham.

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Dr. Wm. deB. MacNider recently attended a meeting of the American Philosophical Society and of the National Academy of Science.

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Dr. W. R. Berryhill recently addressed the Randolph County Medical Society on Atypical Pneumonia.

News Notes from Duke University School of Medicine

November and December, 1940

On November 29-30, 1940, the Tenth Anniversary of the opening of the School of Medicine and Hospital was celebrated and the new Department of Neuropsychiatry was dedicated. One hundred and twenty medical alumni and former members of the house staff were present. Dr. Adolf Meyer, Henry Phipps Professor of Psychiatry of the Johns Hopkins University School of Medicine, addressed the staff, students and alumni on Considerations on Psychiatry or Ergasiatrics as an Essential and Natural Part of All Medical Training and Practice. Special clinics and talks were given by Drs. R. L. Flowers, F. M. Hanes, D. T. Smith, Deryl Hart, Bayard Carter and W. C. Davison.

On November 29, 1940, the Duke University School of Medicine Alumni Association was organized with the following officers: J. M. Arena, president; R. W. Graves, vice-president; J. L. Callaway, secretary-treasurer, L. D. Baker, corresponding secretary.

On December 11, 1940, Dr. Lee E. Farr, Director of Research of the Alfred I. duPont Institute of the Nemours Foundation held a clinic on the Treatment of Nephritis.

News Notes from the State Board of Health

The final figures of the 1940 census, issued within the past week, place the population of North Carolina at 3,571,623, of which number 3,201,808, or ninety per cent, enjoy the protection of organized public health.

Dr. Carl V. Reynolds, in a summary of the State Board of Health's activities during the year 1940, states that:

"No year in the history of the North Carolina State Board of Health has presented greater opportunities for service or imposed more responsibilities than 1940. With the development of our national defense program, a new emphasis is placed on the importance of preventive medicine, with which the Board is chiefly concerned, and there has come the profound conviction that end-results must be de-emphasized and increased attention given those basic factors which involve cause as well as effect.

"On January 1, the Board of Health entered upon a nutrition study, in cooperation with the Duke University School of Medicine, the groundwork for which previously had been laid by Dr. D. F. Milam and Dr. John A. Farrell, both of the Rockefeller Foundation, with the support of the State Health Officer, a local committee, and Dr. W. C. Davison, dean of the Duke Medical School.

"Immediately upon the passage of the selective service act, the State Board of Health launched an intensified health education program to encourage registrants to submit voluntarily to serologic tests for syphilis among young men between 21 and 36. Out of 448,555 who registered for the draft, 130,000 submitted to such tests. Thus, the North Carolina State Board of Health was able to begin the greatest case-finding program and the most extensive epidemiological study ever undertaken by any State, designed to aid in the eradication of syphilis among civilians as well as men under arms.

"Earlier in the year, the State Board of Health announced the results of a venereal disease survey among 9,533 prisoners in camps throughout the State, in cooperation with the North Carolina Highway and Public Works Commission. Since that time the incidence of syphilis among new prisoners has been greatly diminished, reflecting results accomplished in 286 public health venereal disease clinics, which hold 379 weekly sessions, or the equivalent of 19,708 a year. On January 1, there were only 229 such clinics.

"The State Board of Health now is sponsoring a total of 496 clinics throughout North Carolina, including those mentioned above, 20 for crippled children and 190 maternity and infancy clinics.

"During 1940, the Board of Health's Central Tabulating Unit has tabulated 22,140 new venereal disease cases, including 17,940 cases of syphilis and 3,891 cases of gonorrhea. There are now 36,000 active cases of syphilis under treatment in public health clinics. The Central Tabulating Unit has also tabulated 22,453 cases of other infectious and communicable diseases. It processes the equivalent of 42,000,000 cards a year in the course of all its activities.

"One of the outstanding public health accomplishments during 1940 has been the completion of the new $320,000 State Laboratory of Hygiene, including the downtown building and the farm eight miles west of Raleigh.

"The national defense program has also increased the work of the Division of Vital Statistics. It is now issuing approximately 300 delayed birth certificates a day, for those who must prove their citizenship to work in plants with government orders, and for other necessary purposes, in addition to its routine duties.

"The circulation of the Health Bulletin, issued through the Division of Preventive Medicine, has been increased from 55,000 to 60,000 in 1940. Maternity and infancy clinics have been opened in a half dozen new counties. Two professorships have been established for services at the School of Public Health at the University of North Carolina and at Duke University. Dr. A. W. Makepeace, obstetrician, and Dr. Robert B. Lawson, pediatrician, elected to fill these professorships, already have assumed their duties.

"The activities of the School Health Coordinating Service, a conjoint activity of the State Board of Health and the State Department of Public Instruction, have been carried into Person, Orange, Chatham and Wayne counties during 1940.

"During 1940, the State Board of Health, through its Division of Sanitary Engineering, has set up more WPA waterworks and sewer extension and improvement projects than any other State, in proportion to population and wealth. More than 22,000 new sanitary privies have been built in rural communities, bringing the total of such units to over 200,000.

"Organized public service has been extended to three additional counties during the year, with two more now virtually in, making a total of eighty-one.

"The Division of Industrial Hygiene, a conjoint activity of the State Board of Health and the North Carolina Industrial Commission, has given pre-employment examinations to more than 1,500 men in camps at Glenville and Nantahala, who are to work on projects in that section involving national defense, while sanitary and general health protection has been given to 2,000.

"Dental corrections have been given 67,361 underprivileged school children by the Division of Oral Hygiene, while those who were able to pay were referred to their private dentists by the thirty-three school dentists in this Division, including seven Negro dentists, who work among the members of their races.

"There are at this time 17,470 crippled children on the State Board of Health's register. Approximately 1,600 were enrolled this year and 1,323 have been admitted for hospitalization."

Buncombe County Medical Society

The first December meeting of the Buncombe County Medical Society was a dinner meeting, held at the U. S. Veterans Facility at Oteen on December 2. A brief business session was held, and the meeting was then turned over to the medical staff for a clinical conference program. Dr. H. W. Walter gave a case report on the "Use of Sulfathiazole Locally"; Dr. L. E. Kamin gave a paper on "Dermoid Cyst of Mediastinum"; and Dr. Benjamin Schwartz spoke on "Sulfathiazole Therapy in Staphylococcic Septicemia".

On December 20 the annual meeting and banquet was held on the Battery Park Hotel Roof, with Dr. Frank Howard Richardson as toastmaster.

Forsyth County Medical Society

The Forsyth County Medical Society held a business meeting on December 10 for the election of officers. Dr. C. A. Street was elected president, succeeding Dr. B. B. Pool. Dr. Fred Garvey was elected first vice president; Dr. Fielding Combs, second vice president; Dr. P. A. Yoder, secretary; and Dr. Howard M. Starling, treasurer. Delegates for the state convention in 1941 are Dr. B. B. Pool and Dr. W. H. Sprunt; alternate delegates, Drs. J. C. Casstevens, Edgar Benbow, Bruce Brooks, and E. S. Thompson. Dr. Joe F. Belton was elected to the board of censors.

Guilford County Medical Society

The Guilford County Medical Society held its December meeting on Thursday, December 5, at 6:30 p.m., in the Elwood Hotel in High Point. Dr. Phillip Davis, President, presided.

Dr. H. C. Warwick was elected Secretary to replace Dr. Wayne Benton, who has been called into military service.

The Ladies' Auxiliary met with the Society for dinner, and after a brief business session returned for the scientific program.

Dr. I. T. Mann introduced the guest speaker, Dr. William Allan of Charlotte, past President of the State Medical Society, who spoke on Prevention of Hereditary Defects. His talk was illustrated by lantern slides. He traced the pedigree of several families in North Carolina, showing the familial hereditary tendencies. Several members participated in a discussion of Dr. Allan's talk.

Dr. Phillip Davis then turned the gavel over to Dr. Fred Patterson, the incoming President. Dr. Patterson spoke briefly.

Halifax County Medical Society

The Halifax County Medical Society held its regular monthly meeting Friday night, December 13, at the Roanoke Rapids Hospital, at which time Dr. M. C. Maddrey of Roanoke Rapids was elected president of the society for 1941; Dr. O. F. Smith of Scotland Neck, vice-president; and Dr. Robert F. Young of Halifax, secretary and treasurer.

Dr. E. C. Hamblen, well known endocrinologist of Duke University, was the guest speaker of the meeting. He was accompanied by Dr. Kenneth Cyler, an associate at Duke.

A rising vote of thanks was given Dr. F. W. M. White of Halifax, retiring president of the society, for the splendid programs he had arranged during the past year.

The Hospital Saving Association of North Carolina, Inc., is nationally approved by the American Hospital Association, and is the twelfth largest group hospitalization plan in the United States.

Mississippi Valley Medical Society 1941 Essay Contest

The Mississippi Valley Medical Society offers annually a cash prize of $100.00, a gold medal, and a certificate of award for the best unpublished essay on any subject of general medical interest (including medical economics) and practical value to the general practitioner of medicine. Certificates of merit may also be granted to the physicians whose essays are rated second and third best. Contestants must be members of the American Medical Association who are residents of the United States. The winner will be invited to present his contribution before the next annual meeting of the Mississippi Valley Medical Society at Cedar Rapids, Iowa, October 1, 2, 3, 1941, the Society reserving the exclusive right to first publish the essay in its official publication—the **Mississippi Valley Medical Journal** (incorporating the **Radiologic Review**). All contributions shall not exceed 5000 words, be typewritten in English in manuscript form, submitted in five copies and must be received not later than May 1, 1941. The winning essay of the 1940 contest appears in the January, 1941 issue of the **Mississippi Valley Medical Journal** (Quincy, Ill.) Further details may be secured from Harold Swanberg, M.D., Secretary, Mississippi Valley Medical Society, 209-224 W. C. U. Building, Quincy, Illinois.

News Notes

Dr. C. O. DeLaney died at his home at Winston-Salem on December 15.

* * *

Dr. Preston White, of Charlotte, has been elected a member of the American Clinical and Climatological Association.

* * *

Dr. H. H. Briggs, Jr., of Asheville, has been certified by the American Board of Ophthalmology.

Three Quarters of a Century for Parke, Davis & Company

The year 1941 marks the Diamond Anniversary of the founding of Parke, Davis & Company, a firm which had its inception in a small drug store in the City of Detroit, Michigan, and which, during the past seventy-five years, has become the world's largest makers of pharmaceutical and biological products.

From the very beginning, back in 1866, Parke, Davis & Company has engaged in research work with the object of making available to pharmacists and physicians medicinal preparations of the highest degree of accuracy.

In the early 70's, pharmaceutical progress meant the discovery of new vegetable drugs. Energetic—and extensive — explorations gave to the medical profession such valuable and widely used drugs as Cascara and Coca. Then, in 1879, came one of Parke-Davis's greatest contributions to pharmacy and medicine—the introduction of the first chemically standardized extract known to pharmacy. Desiccated Thyroid Gland, the first endocrine product supplied by the Company, was introduced in 1893. One year later, Parke-Davis established the first commercial biological laboratory in the United States. In 1897 came the introduction of the first physiologically assayed and standardized extracts. And throughout these early years, the fundamental Parke-Davis policy — precision in pharmaceutical manufacture—was crystallizing.

Since the turn of the century, progress of the Company has continued apace. An aggressive pro-

gram of research has been zealously pursued, marked by the introduction of such important medicinal products as Adrenalin, Ventriculin, Theelin, Pitocin, Pitressin, Mapharsen, Neo-Silvol, Antuitrin-S, Meningococcus Antitoxin, Dilantin Sodium, and many others. Diversified research activities cover the major phases of medical treatment—including the endocrine, biological, vitamin, and chemotherapeutic —and new discoveries are carefully evaluated through the Company's extensive facilities for clinical investigation.

The Company's home offices and research and manufacturing laboratories in Detroit occupy six city blocks on the Detroit Riverfront, adjacent to the Detroit-Walkerville ferry, which connects the City of Detroit with the Province of Ontario, Canada.

A beautiful farm of 700 acres, known as Parkedale and located near Rochester, Michigan, about 30 miles from Detroit, is utilized for the production of antitoxins, serums and vaccines, and for the cultivation of medicinal plants.

In addition to its Detroit headquarters, branches and depots are maintained in important cities throughout the country, the list including Atlanta, Baltimore, Boston, Buffalo, Chicago, Cincinnati, Dallas, Denver, Indianapolis, Kansas City, Minneapolis, New Orleans, New York, Philadelphia, Pittsburgh, San Francisco, St. Louis, and Seattle.

In the foreign field, to care for the Parke-Davis business which extends to every quarter of the globe, branches are located in London, England; Sydney, N. S. W.; Walkerville, Ontario; Montreal, Quebec; Toronto, Ontario; Winnipeg, Manitoba; Bombay, India; Havana, Cuba; Buenos Aires, Argentina; Rio de Janeiro, Brazil; and Mexico City, Mexico.

Through the use of full-pages in leading national magazines Parke, Davis & Company are carrying on an advertising program that has attracted wide attention. As might be expected, their advertising is unique, ethical, distinctive. They make no direct attempt to sell their products to the public by means of this publicity. In a sincere effort to render a valuable service to the medical profession, they are running a striking series of messages based on the "See Your Doctor" theme, and physicians throughout the country are constantly experiencing evidences of the results of this broad educational program.

The Beginnings of Disease.—Occupied by his interest in and respect for scientific methods, the doctor is apt to become unmindful of the fact that the beginnings of disease are insidious, cause little disturbance of function and give no detectable signs. Sooner or later they lead to the development of symptoms; the affected person feels that he is not well, and he seeks advice first at a time when the most careful examinations known will fail to disclose any objective cause for his discomfort. His subjective sensations are the earliest manifestations of ill-health. How little many of them are understood and how often they are misinterpreted! Who among physicians has not labeled such a complainer without abnormal signs a hypochondriac, a neurotic or even a malingerer, only to be embarrassed later to find that disease had developed and made him ready to subscribe to the saying of the late William S. Thayer, "After twenty years I relabel my neurotics my diagnostic errors." —Austrian, Charles R., M.D.: The Care of the Patient, New England J. Med. 223:696 (October 31) 1940.

In Memoriam

MEMORIAL ADDRESS

FOR ALL THE MEMBERS OF THE NINTH DISTRICT MEDICAL SOCIETY WHO HAVE DIED SINCE ITS ORGANIZATION IN 1912

Dr. James W. Davis

Statesville

My Fellow Physicians:

Again and again we are called upon to suspend our daily labor and bury our dead. Each time the solemn lesson is impressed upon our hearts that from earth we came, and into earth we must return again.

This past year has witnessed the passing of fellow physicians. Some have been cut down in the very prime of their professional life and usefulness, others in the evening of long and serviceable careers. All carried to the end the finest traditions of the sons of Aesculapius. They blended the splendid assets of servants and leaders. They have left behind them a heritage of duty well done. With rare exceptions, they were imbued with the knowledge that personal sacrifice and abnegation is a part of a doctor's daily life. Never too proud to perform the most menial duty, they were brave enough and wise enough to serve with wisdom and to lead with valor. They lived their lives and practiced their art according to their individual lights. We miss their counsel and their friendship; we sympathize with their loved ones who are deprived of their companionship and guidance; and as a Society we salute their memory and record our sorrow.

If these brothers whom we call dead could speak to us today, what words would they speak into our listening ears? Would they speak aught of the great political and economic questions which vex us? Would their words concern the grasping schemes of nations and the petty ambitions of men? Would they speak to us of party, or business, or commerce?

Nay, out of their richer and holier experiences they would speak to us in the old familiar way of the simple things of life—the things nearest and dearest to the human heart.

I think, first of all, they would tell us that we **should face the future with faith, hope and courage; that we should not fear death, for at eventide there is light.** They would tell us that there is a life beyond this life, and that in that life there is work to do and tasks to accomplish. They would tell us that there are sweet and unchanging friendships in the spirit land; that it is a beautiful home where there are many happy reunions, but no sad partings, land where no sorrows shall gnaw the heart nor ever a tender tie be broken.

They would remind us, too, of the **nobility of sacrifice, and of the duty to minister unto others.** They would tell us that the world remembers only for a while those who have been its masters, but that it never forgets those who have been its servants.

They would have us remember the **spirit of American patriotism.** They would tell us that the noblest thing anyone can do is to live for his country—live to make it a purer, nobler, and finer nation. And

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Read at the Ninth District Medical Society Meeting, Mooresville, September 26, 1940.

they would recall the words of **Proverbs**: "Righteousness exalteth a nation; but sin is a reproach to any people."

They were men of incorruptible personal integrity. I suppose no man ever attempted to approach one of them with any sort of bribe. No stain was upon their escutcheon; no syllable of suspicion that I ever heard was whispered against their character. They walked in perfect and noble self-control.

They were men who believed in right, who had a profound conviction that the courses of this world must be ordered in accordance with lasting righteousness; that no nation can expect success in life except as it conforms to the eternal love of the infinite Lord.

Simplicity belonged to them. I need not dwell upon it, and I close the statement of these qualities by saying that underlying all and overreaching all and penetrating all was a profound loyalty toward the great King of the universe, the Author of all good, the eternal Hope of all that trust in Him.

May I say further that, to whatever we may attribute all the illustriousness of these men, all the greatness of their achievements, it seems to me that these successes were largely due to the moral qualities of which I have spoken. They drew to them the hearts of everyone, and particularly of those who best knew them. They called to their side helpers in every exigency of their careers.

Their high qualities drew to them the good will of their associates in an eminent degree. They believed in them, felt their kindness, confided in their honesty and honor.

While our brethren have passed away to their long home, while we commemorate their virtues and their worth, and preserve their memory in our hearts, we have yet another duty to perform. It is to remember kindly the sorrowing kindred, the fathers and mothers, sisters and brothers, the widows and orphans of our deceased brethren.

It is befitting to quote Voltaire, the French philosopher and writer, who said:

> "But nothing is more estimable than the physician who, having studied nature from his youth, knows the properties of the human body, the diseases which assail it, the remedies which will benefit it, exercises his art with caution and pays equal attention to the rich and the poor."

Yes, the world is better because these departed colleagues lived. Death cannot take from us the memory of what they were and what they did.

Their work here is finished. Their spirts have departed hence to join in sweet and perfect harmony and comradeship that innumerable host of immortals who wrought faithfully and well here, and who are enjoying their just rewards on the other shore.

Peace to their ashes! Honor to their name! Immortality to their memory!

The Necessity for Art in Medicine.—The scientific physician who does not interest himself in or acquire the subtleties of the art invariably fails in the full availment of his skill and talents to the patient. The purely scientific approach to a medical problem may suffice in many instances but it is just as likely to be thwarted unless applied in a practical, humane and understanding manner, modified if necessary to meet the requirements of the individual. One sees too many frustrations resulting from the inflexible routine of strictly scientific endeavor.—F. A. Willius, M.D.: A Talk on the Science and the Art of Medical Practice, Proc. Staff Meet. Mayo Clinic 15:650 (October 9) 1940.

BOOK REVIEWS

A Textbook of Clinical Pathology. Edited by Roy R. Kracke and Francis P. Parker, Emory University, Atlanta, Georgia. 780 pages with 257 illustrations, 23 of which are in color. Second Edition, thoroughly revised. Baltimore: Williams and Wilkins Company, 1940. Price $6.00.

This book represents the efforts of fourteen experienced teachers. Its aim is well expressed in the Foreword: "Designed primarily for accurate and comprehensive teaching of this important subject to students of medicine and the interpretation of laboratory findings for the practitioner of medicine." It is made as brief as is consistent with clarity—largely by describing "the **one** most reliable and simple technic for each laboratory procedure."

The whole field of pathology, so far as it concerns the clinician, is covered in a clear, practical fashion. Virtually all the newer laboratory methods are described, including the assays of hormones and vitamins, and the tests for the blood concentrations of the sulfonamides. It was rather surprising to note the statement, in discussing sulfathiazole, that "the blood concentration has been observed to rise as high as 30 mg. per cent. The effective range appears to be close to 10 mg. per cent." Perhaps some allowance should be made for the personal equation, but this reviewer does not recall ever having a concentration reported much higher than 4 mg. per cent, even with large doses; and a competent urologist reports that he is satisfied with a concentration of 2 to 3 mg. per cent.

The final chapter, by Dr. George Herrmann, is devoted to "Laboratory Examinations in Clinical Practice", and is most practical and helpful; so are the four appendices, on "Laboratory Equipment and Maintenance", "Solutions: Weights and Measures: Normal Solutions", "Bacteriologic Stains and Staining Methods", and "Preparation of Culture Media".

The book can be unreservedly recommended for both students and practitioners.

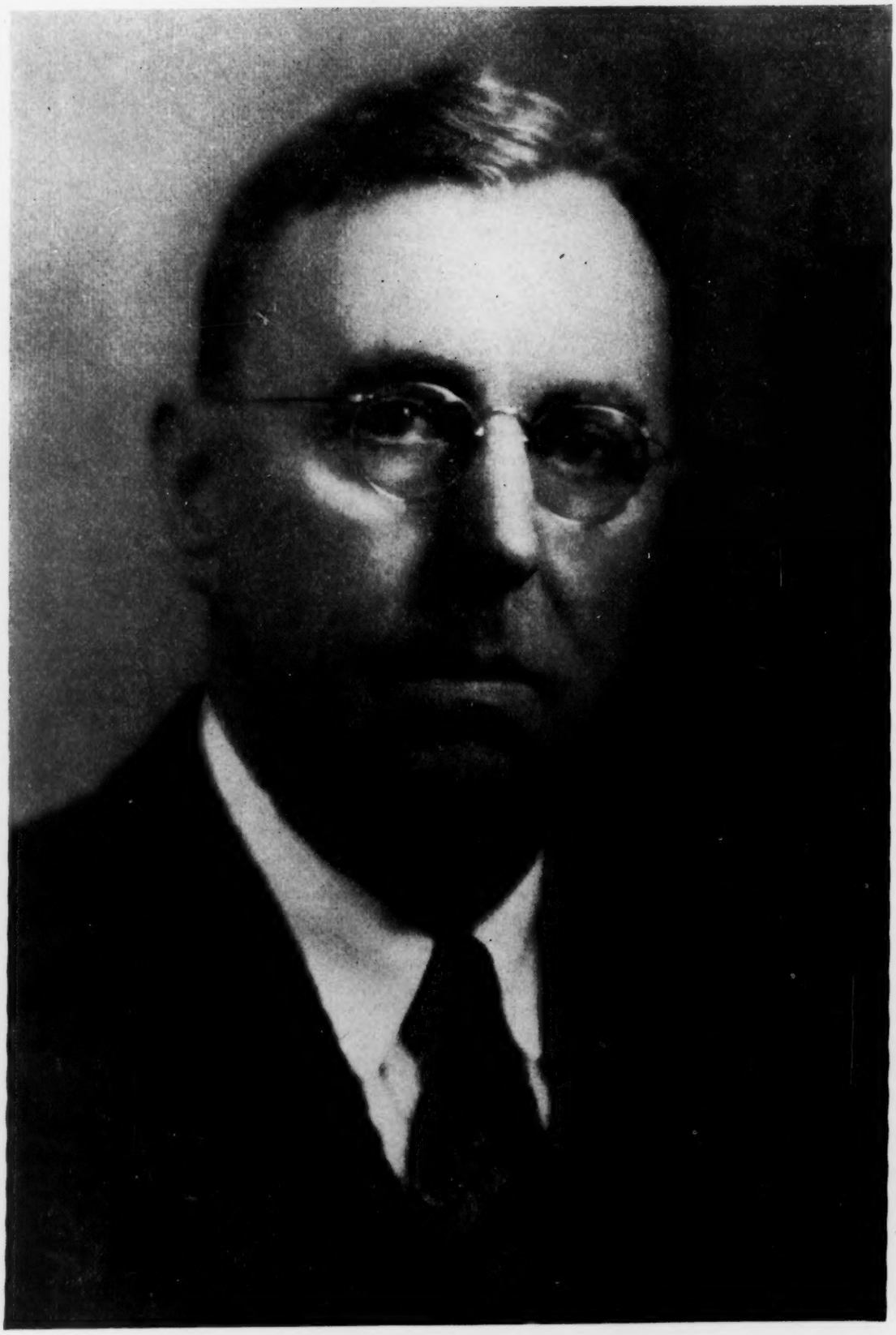
Squibb Offers Pyridoxine In Microcaps and Solution

Pyridoxine Hydrochloride (the hydrochloride of pure, synthetic vitamin B_6) is now being supplied by E. R. Squibb & Sons, New York, in two forms—Microcaps (miniature capsules) for oral administration containing 1 mg. and 10 mg. each, and aqueous Solution for parenteral administration, containing 25 mg. per cc.

Indications for Pyridoxine therapy are not well established as yet, but they include vitamin B_6 deficiency states. Limited clinical investigation suggests the use of Pyridoxine in the treatment of paralysis agitans (Parkinson's syndrome), myasthenia gravis and pseudohypertrophic muscular dystrophy.

Solution Pyridoxine Hydrochloride Squibb may be given by the subcutaneous, intramuscular or intravenous route; the Microcaps are administered orally. The suggested prophylactic dose is 1 to 5 milligrams daily by mouth. The therapeutic dose suggested is 10 to 50 milligrams daily, preferably by a parenteral route.

One mg. Microcaps are supplied in vials of 50, and 10 mg. in boxes of 20. The Solution comes in 5-cc. rubber-capped vials containing 25 mg. Pyridoxine Hydrochloride per 1 cc., preserved with 0.5 per cent chlorobutanol.



DR. THOMAS W. M. LONG

JANUARY 14, 1886 — FEBRUARY 3, 1941